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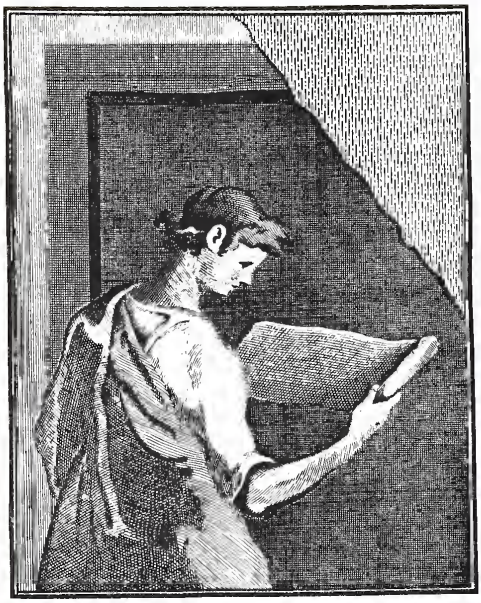

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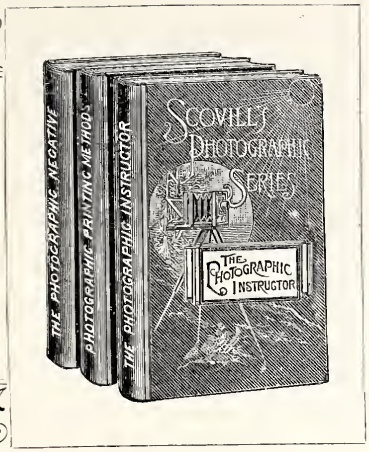

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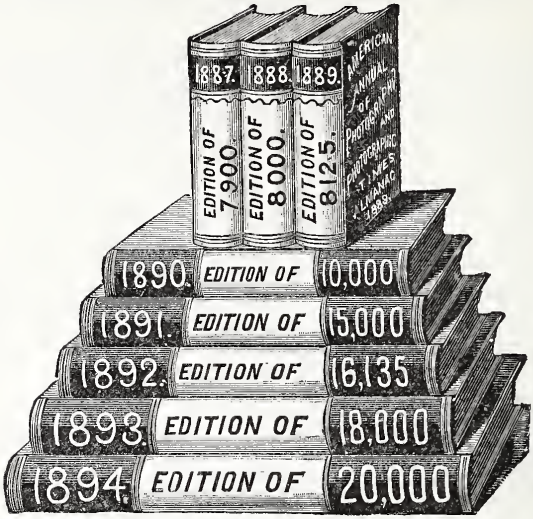

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ALMANAC

FOR 1895

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PREFACE.

THE aim and intention of THE AMERICAN ANNUAL OF PHOTOGRAPHY AND PHOTOGRAPHIC TIMES ALMANAC are so well and widely known that but few explanatory or prefatory remarks become necessary in introducing this, the ninth, volume of the series. We take this opportunity, however, of thanking all those who have so generously come forward, in response to our request for contributions, with articles and pictures. Never before have we been able to present to our readers so much interesting matter, written by men who have so well earned for themselves honorable distinction in the history of our art-science, and who have, by their unselfish energies, given to this work the inestimable value which must ever be attached to the thoughts of so many minds directed to the numerous and various phases of one subject.

Many articles arrived after our pages were

already overflowing. To the contributors of these we tender our thanks and apologies. We increased the number of pages considerably, a fact which accounts for the peculiarity of the numbering toward the end of the book, but even then we had on hand many other valuable articles which will appear in the columns of *The Photographic Times.*

This is undoubtedly the age of illustrating, and, recognizing this fact, we have spared no trouble or expense in making the work pictorially interesting ; nor must we forget to acknowledge our indebtedness to the photo-engravers and photo-mechanical printers who have assisted us in this.

In another portion of the book we have endeavored to briefly chronicle the events of the past year, and in others to render this work a trustworthy and copious book of reference on all matters connected with photography.

With these few words we launch this volume out into the world, and await the verdict of an indulgent public.

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REFERENCE CALENDAR FOR THREE YEARS.

1894

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CENTURY CALENDAR.

For explanation see opposite page.

Table 1. Years 1800-1901.

For economy of space, the century prefixes "18" and "19" have been omitted.

00	01	02	03	**04**	04	05
06	07	**08**	08	09	10	11
12	12	13	14	15	**16**	16
17	18	19	**20**	20	21	22
23	**24**	24	25	26	27	**28**
28	29	30	31	**32**	32	33
34	35	**36**	36	37	38	39
40	40	41	42	43	**44**	44
45	46	47	**48**	48	49	50
51	**52**	52	53	54	55	**56**
56	57	58	59	**60**	60	61
62	63	**64**	64	65	66	67
68	68	69	70	71	**72**	72
73	74	75	**76**	76	77	78
79	**80**	80	81	82	83	84
84	85	86	87	88	88	89
90	91	**92**	92	93	94	95
96	96	97	98	99	00	01

Table 2. 1st day of Month.

JAN	W	Th	F	S	**S**	M	Tu
FEB	S	**S**	M	Tu	W	Th	F
MAR	S	**S**	M	Tu	W	Th	F
APL	Tu	W	Th	F	S	**S**	M
MAY	Th	F	S	**S**	M	Tu	W
JUNE	**S**	M	Tu	W	Th	F	S
JULY	Tu	W	Th	F	S	**S**	M
AUG	F	S	**S**	M	Tu	W	Th
SEP	M	Tu	W	Th	F	S	**S**
OCT	W	Th	F	S	**S**	M	Tu
NOV	S	**S**	M	Tu	W	Th	F
DEC	M	Tu	W	Th	F	S	**S**

Table 3. Days of Month.

1	**S**	M	Tu	W	Th	F	S	1
2	M	Tu	W	Th	F	S	**S**	2
3	Tu	W	Th	F	S	**S**	M	3
4	W	Th	F	S	**S**	M	Tu	4
5	Th	F	S	**S**	M	Tu	W	5
6	F	S	**S**	M	Tu	W	Th	6
7	S	**S**	M	Tu	W	Th	F	7
8	**S**	M	Tu	W	Th	F	S	8
9	M	Tu	W	Th	F	S	**S**	9
10	Tu	W	Th	F	S	**S**	M	10
11	W	Th	F	S	**S**	M	Tu	11
12	Th	F	S	**S**	M	Tu	W	12
13	F	S	**S**	M	Tu	W	Th	13
14	S	**S**	M	Tu	W	Th	F	14
15	**S**	M	Tu	W	Th	F	S	15
16	M	Tu	W	Th	F	S	**S**	16
17	Tu	W	Th	F	S	**S**	M	17
18	W	Th	F	S	**S**	M	Tu	18
19	Th	F	S	**S**	M	Tu	W	19
20	F	S	**S**	M	Tu	W	Th	20
21	S	**S**	M	Tu	W	Th	F	21
22	**S**	M	Tu	W	Th	F	S	22
23	M	Tu	W	Th	F	S	**S**	23
24	Tu	W	Th	F	S	**S**	M	24
25	W	Th	F	S	**S**	M	Tu	25
26	Th	F	S	**S**	M	Tu	W	26
27	F	S	**S**	M	Tu	W	Th	27
28	S	**S**	M	Tu	W	Th	F	28
29	**S**	M	Tu	W	Th	F	S	29
30	M	Tu	W	Th	F	S	**S**	30
31	Tu	W	Th	F	S	**S**	M	31

EXPLANATION OF CENTURY CALENDAR.

(See opposite page.)

To ascertain the day of the week corresponding to any date from the 1st January, 1800, to the 31st of December, 1901, both inclusive: find the given year in Table 1, and follow downward the vertical column containing it, until reaching, in Table 2, the horizontal line beginning with the given month; at the intersection of the column and line will be found the day of the week with which the month commences. In Table 3, find the vertical column beginning with that day of the week, and follow it downward until reaching the horizontal line beginning with the given day of the month; at the intersection of the column and line will be found the day of the week corresponding to the given year, month and day.

NOTE.—Leap-years will be found entered twice in Table 1; first in heavy-faced type; and afterward in ordinary characters. The first entry is to be used when the given date is in January or February of the given year; the second, (ordinary type), when falling in any other month.

EXAMPLES.—Given the 29th of February, 1824:—To find the day of the week on which it fell. Under the first entry of 24, in Table 1, and opposite Feb., in Table 2, is found Sunday. Under Sunday in Table 3, and opposite 29, is found Sunday, which is the required day of the week. Given the 22d of December, 1864:—Under the second entry of 64, in Table 1, and opposite Dec., in Table 2, is found Th. In Table 3, under Th., and opposite 22, is found Th., which is the required day of the week. Given the 12th of September, 1855:—Under 55, in Table 1, and opposite Sept., in Table 2, is found S. In Table 3, under S and opposite 12, is found W., which is the required day of the week.

ECLIPSES IN 1895.

NOTE.—*Local mean time for the latitude of New York City is used in reckoning eclipses, sunset and sunrise. Subtract four minutes to change the reckoning to Eastern standard time of 75th meridian.*

Moon's phases are calculated for Eastern standard time. "Morn." is understood to extend from Midnight to Noon; "Eve." from Noon to Midnight.

There will be five eclipses this year, two of the Moon and three of the Sun.

I.—*A total eclipse of the Moon*, March 10, visible in North and South America, Europe and Western Asia.

II.—*A partial eclipse of the Sun*, March 26, invisible in the United States; visible in Western Europe, England and Western Spain, Portugal and France; also in the north-eastern provinces of British America.

III.—*A partial eclipse of the Sun*, August 20, invisible in America; visible in North-western Asia and Europe east of St. Petersburg.

IV.—*A total eclipse of the Moon*, September 3 and 4, visible in North and South America, Western Europe and Africa.

V.—*A partial eclipse of the Sun*, September 18, visible in Eastern Australia, New Zealand and the Pacific Ocean.

THE SEASONS.

SPRING begins	March 20, 3 p.m.	AUTUMN begins	September 23, 2 a.m.
SUMMER begins	June 21, noon.	WINTER begins	December 21, 9 p.m.

CHURCH DAYS.

Septuagesima	Feb. 10	Easter Sunday	April 14
Sexagesima	Feb. 17	Low Sunday	April 21
Quinquagesima	Feb. 24	Rogation Sunday	May 19
Ash Wednesday	Feb. 27	Ascension Day	May 23
Quadragesima	March 3	Whitsunday (Pent.)	June 2
Mid-Lent Sunday	March 24	Trinity Sunday	June 9
Palm Sunday	April 7	Corpus Christi	June 13
Good Friday	April 12	Advent Sunday	Dec. 1

CHRONOLOGICAL CYCLES.

Dominical Letter	F
Epact	4
Golden Number (Lunar Cycle)	15
Solar Cycle	28
Roman Indiction	8

CHRONOLOGICAL ERAS.

The year 1895, which comprises the latter part of the 119th and the beginning of the 120th year of the INDEPENDENCE OF THE UNITED STATES OF AMERICA, corresponds to the year 6608 of the JULIAN PERIOD; the years 7403-7404 of the BYZANTINE ERA; the years 5655-56 of the JEWISH ERA; the year 2648 since the FOUNDATION OF ROME, according to Varro; the year 2671 of the OLYMPIADS; the year 1611 of the era of DIOCLETIAN; the year 2555 of the JAPANESE ERA; the years 1312-13 of the MOHAMMEDAN ERA.

The 1st day of January of the year 1895 is the 2,413,195th day since the commencement of the JULIAN PERIOD.

The JULIAN CALENDAR, which is still used in the Russian Empire, dates twelve days back of our own—the GREGORIAN CALENDAR. Thus a letter from St. Petersburg dated January 1st was really written on January 13th.

The Russians generally use, in official documents and frequently in business correspondence, two dates, which they call "old style" and "new style"; and in Alaska three dates have been used on their documents, because the early navigators forgot to make allowance for the crossing of the 180th meridian in sailing from Siberia to North America.

JANUARY, 1895.

1st MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
1	**1**	Tu	7 25	4 43
2	**2**	W	7 25	4 44
3	**3**	Th	7 25	4 45
4	**4**	F	7 25	4 46
5	**5**	Sa	7 25	4 47
6	**6**	§	7 25	4 48
7	**7**	M	7 25	4 49
8	**8**	Tu	7 24	4 50
9	**9**	W	7 24	4 51
10	**10**	Th	7 24	4 52
11	**11**	F	7 24	4 53
12	**12**	Sa	7 23	4 54
13	**13**	§	7 23	4 55
14	**14**	M	7 23	4 56
15	**15**	Tu	7 22	4 57
16	**16**	W	7 22	4 59
17	**17**	Th	7 21	5 00
18	**18**	F	7 21	5 01
19	**19**	Sa	7 21	5 02
20	**20**	§	7 20	5 03
21	**21**	M	7 19	5 04
22	**22**	Tu	7 18	5 05
23	**23**	W	7 17	5 07
24	**24**	Th	7 17	5 08
25	**25**	F	7 16	5 09
26	**26**	Sa	7 16	5 10
27	**27**	§	7 15	5 11
28	**28**	M	7 14	5 13
29	**29**	Tu	7 13	5 14
30	**30**	W	7 12	5 15
31	**31**	Th	7 12	5 16

Moon's Phases.

First Q., Jan. 4, 2 h. 52 m., morn.
Full M., Jan. 11, 1 h. 50 m., morn.
Last Q., Jan. 17, 5 h. 55 m., eve.
New M., Jan. 25, 4 h. 26 m., eve.

FEBRUARY, 1895.

2d MONTH. 28 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M	N. Y. City. Sun sets. H. M.
32	**1**	F	7 11	5 18
33	**2**	Sa	7 10	5 19
34	**3**	§	7 09	5 20
35	**4**	M	7 07	5 21
36	**5**	Tu	7 06	5 22
37	**6**	W	7 05	5 23
38	**7**	Th	7 04	5 25
39	**8**	F	7 03	5 26
40	**9**	Sa	7 02	5 27
41	**10**	§	7 01	5 28
42	**11**	M	7 00	5 30
43	**12**	Tu	6 58	5 31
44	**13**	W	6 57	5 32
45	**14**	Th	6 56	5 34
46	**15**	F	6 55	5 35
47	**16**	Sa	6 53	5 36
48	**17**	§	6 52	5 37
49	**18**	M	6 51	5 39
50	**19**	Tu	6 49	5 40
51	**20**	W	6 48	5 41
52	**21**	Th	6 46	5 43
53	**22**	F	6 45	5 44
54	**23**	Sa	6 44	5 45
55	**24**	§	6 42	5 46
56	**25**	M	6 41	5 48
57	**26**	Tu	6 39	5 49
58	**27**	W	6 38	5 50
59	**28**	Th	6 37	5 51

Moon's Phases.

First Q., Feb. 2, 7 h. 16 m., eve.
Full M., Feb. 9, 0 h. 23 m., eve.
Last Q., Feb. 16, 8 h. 9 m., morn.
New M., Feb. 24, 11 h. 44 m., morn.

MARCH, 1895.

3d MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
60	**1**	F	6 35	5 53
61	**2**	Sa	6 34	5 53
62	**3**	☉	6 32	5 54
63	**4**	M	6 30	5 55
64	**5**	Tu	6 29	5 56
65	**6**	W	6 27	5 57
66	**7**	Th	6 25	5 58
67	**8**	F	6 24	5 59
68	**9**	Sa	6 22	6 00
69	**10**	☉	6 20	6 01
70	**11**	M	6 19	6 02
71	**12**	Tu	6 17	6 03
72	**13**	W	6 16	6 04
73	**14**	Th	6 14	6 05
74	**15**	F	6 12	6 06
75	**16**	Sa	6 11	6 08
76	**17**	☉	6 09	6 09
77	**18**	M	6 07	6 10
78	**19**	Tu	6 06	6 11
79	**20**	W	6 04	6 12
80	**21**	Th	6 02	6 13
81	**22**	F	6 01	6 14
82	**23**	Sa	5 59	6 15
83	**24**	☉	5 58	6 16
84	**25**	M	5 56	6 17
85	**26**	Tu	5 54	6 18
86	**27**	W	5 52	6 19
87	**28**	Th	5 51	6 20
88	**29**	F	5 49	6 21
89	**30**	Sa	5 47	6 22
90	**31**	☉	5 45	6 23

Moon's Phases.

First Q., March 4, 7 h. 40 m., morn.
Full M., March 10, 10 h. 38 m., eve.
Last Q , March 18, 0 h. 32 m., morn.
New M., March 26, 5 h. 25 m., morn.

APRIL, 1895.

4th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
91	**1**	M	5 44	6 24
92	**2**	Tu	5 42	6 26
93	**3**	W	5 41	6 27
94	**4**	Th	5 39	6 28
95	**5**	F	5 37	6 29
96	**6**	Sa	5 36	6 30
97	**7**	☉	5 34	6 31
98	**8**	M	5 33	6 32
99	**9**	Tu	5 31	6 33
100	**10**	W	5 30	6 34
101	**11**	Th	5 28	6 35
102	**12**	F	5 26	6 36
103	**13**	Sa	5 25	6 37
104	**14**	☉	5 24	6 38
105	**15**	M	5 22	6 39
106	**16**	Tu	5 20	6 40
107	**17**	W	5 19	6 41
108	**18**	Th	5 17	6 42
109	**19**	F	5 16	6 43
110	**20**	Sa	5 14	6 44
111	**21**	☉	5 13	6 45
112	**22**	M	5 11	6 46
113	**23**	Tu	5 10	6 47
114	**24**	W	5 08	6 48
115	**25**	Th	5 07	6 49
116	**26**	F	5 06	6 50
117	**27**	Sa	5 04	6 51
118	**28**	☉	5 03	6 52
119	**29**	M	5 02	6 53
120	**30**	Tu	5 00	6 55

Moon's Phases.

First Q., April 2, 4 h. 28 m., eve.
Full M., April 9, 8 h. 43 m., morn.
Last Q., April 16, 6 h. 22 m., eve.
New M., April 24, 8 h. 11 m., eve.

MAY, 1895.

5th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
121	**1**	W	4 59	6 56
122	**2**	Th	4 58	6 57
123	**3**	F	4 56	6 58
124	**4**	Sa	4 55	6 59
125	**5**	☧	4 54	7 00
126	**6**	M	4 53	7 01
127	**7**	Tu	4 52	7 02
128	**8**	W	4 51	7 03
129	**9**	Th	4 49	7 04
130	**10**	F	4 48	7 05
131	**11**	Sa	4 47	7 06
132	**12**	☧	4 46	7 07
133	**13**	M	4 45	7 08
134	**14**	Tu	4 44	7 09
135	**15**	W	4 43	7 10
136	**16**	Th	4 42	7 11
137	**17**	F	4 41	7 12
138	**18**	Sa	4 40	7 13
139	**19**	☧	4 39	7 14
140	**20**	M	4 39	7 15
141	**21**	Tu	4 38	7 16
142	**22**	W	4 37	7 17
143	**23**	Th	4 36	7 18
144	**24**	F	4 36	7 19
145	**25**	Sa	4 35	7 20
146	**26**	☧	4 34	7 20
147	**27**	M	4 34	7 21
148	**28**	Tu	4 33	7 22
149	**29**	W	4 32	7 23
150	**30**	Th	4 32	7 23
151	**31**	F	4 31	7 24

Moon's Phases.

First Q., May 1, 10 h. 44 m., eve.
Full M., May 8, 6 h. 59 m., eve.
Last Q., May 16, 0 h. 44 m., eve.
New M., May 24, 7 h. 46 m., morn.
First Q., May 31, 3 h. 48 m., morn.

JUNE, 1895.

6th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
152	**1**	Sa	4 31	7 24
153	**2**	☧	4 30	7 25
154	**3**	M	4 30	7 26
155	**4**	Tu	4 30	7 26
156	**5**	W	4 29	7 27
157	**6**	Th	4 29	7 28
158	**7**	F	4 29	7 28
159	**8**	Sa	4 29	7 29
160	**9**	☧	4 28	7 30
161	**10**	M	4 28	7 30
162	**11**	Tu	4 28	7 31
163	**12**	W	4 28	7 31
164	**13**	Th	4 28	7 32
165	**14**	F	4 28	7 32
166	**15**	Sa	4 28	7 32
167	**16**	☧	4 28	7 33
168	**17**	M	4 28	7 33
169	**18**	Tu	4 28	7 33
170	**19**	W	4 28	7 34
171	**20**	Th	4 29	7 34
172	**21**	F	4 29	7 34
173	**22**	Sa	4 29	7 34
174	**23**	☧	4 29	7 34
175	**24**	M	4 29	7 34
176	**25**	Tu	4 30	7 35
177	**26**	W	4 30	7 35
178	**27**	Th	4 30	7 35
179	**28**	F	4 31	7 35
180	**29**	Sa	4 31	7 35
181	**30**	☧	4 32	7 35

Moon's Phases.

Full M., June 7, 6 h 0 m., morn.
Last Q., June 15, 6 h. 28 m., morn.
New M., June 22, 4 h. 51 m., eve.
First Q., June 29, 9 h. 1 m., morn.

JULY, 1895.

7th MONTH. 31 DAYS

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
182	**1**	M	4 32	7 35
183	**2**	Tu	4 32	7 35
184	**3**	W	4 33	7 34
185	**4**	Th	4 33	7 34
186	**5**	F	4 34	7 34
187	**6**	Sa	4 35	7 34
188	**7**	☉	4 35	7 33
189	**8**	M	4 36	7 33
190	**9**	Tu	4 37	7 33
191	**10**	W	4 37	7 32
192	**11**	Th	4 38	7 32
193	**12**	F	4 39	7 31
194	**13**	Sa	4 39	7 31
195	**14**	☉	4 40	7 30
196	**15**	M	4 41	7 30
197	**16**	Tu	4 42	7 29
198	**17**	W	4 43	7 29
199	**18**	Th	4 44	7 28
200	**19**	F	4 44	7 27
201	**20**	Sa	4 45	7 26
202	**21**	☉	4 46	7 26
203	**22**	M	4 47	7 25
204	**23**	Tu	4 48	7 24
205	**24**	W	4 48	7 23
206	**25**	Th	4 49	7 23
207	**26**	F	4 50	7 22
208	**27**	Sa	4 51	7 21
209	**28**	☉	4 52	7 20
210	**29**	M	4 53	7 19
211	**30**	Tu	4 54	7 18
212	**31**	W	4 55	7 17

Moon's Phases.

Full M., July 6, 6 h. 29 m., eve.
Last Q., July 14, 10 h. 31 m., eve.
New M., July 22, 0 h. 32 m., morn.
First Q., July 28, 3 h. 36 m., eve.

AUGUST, 1895.

8th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
213	**1**	Th	4 56	7 16
214	**2**	F	4 57	7 14
215	**3**	Sa	4 58	7 13
216	**4**	☉	4 59	7 12
217	**5**	M	5 00	7 11
218	**6**	Tu	5 01	7 10
219	**7**	W	5 02	7 09
220	**8**	Th	5 03	7 07
221	**9**	F	5 04	7 06
222	**10**	Sa	5 05	7 05
223	**11**	☉	5 06	7 04
224	**12**	M	5 07	7 02
225	**13**	Tu	5 08	7 01
226	**14**	W	5 09	7 00
227	**15**	Th	5 10	6 58
228	**16**	F	5 11	6 57
229	**17**	Sa	5 12	6 55
230	**18**	☉	5 13	6 54
231	**19**	M	5 14	6 53
232	**20**	Tu	5 15	6 51
233	**21**	W	5 16	6 50
234	**22**	Th	5 17	6 48
235	**23**	F	5 17	6 47
236	**24**	Sa	5 18	6 45
237	**25**	☉	5 19	6 44
238	**26**	M	5 20	6 42
239	**27**	Tu	5 21	6 41
240	**28**	W	5 22	6 39
241	**29**	Th	5 23	6 37
242	**30**	F	5 24	6 36
243	**31**	Sa	5 25	6 34

Moon's Phases.

Full M., Aug. 5, 8 h. 51 m., morn.
Last Q., Aug. 13, 0 h., 18 m., eve.
New M., Aug. 20, 7 h. 56 m., morn.
First Q., Aug. 27, 0 h. 43 m., morn.

SEPTEMBER, 1895.

9th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
244	**1**	♄	5 26	6 33
245	**2**	M	5 27	6 31
246	**3**	Tu	5 28	6 29
247	**4**	W	5 29	6 28
248	**5**	Th	5 30	6 26
249	**6**	F	5 31	6 25
250	**7**	Sa	5 32	6 23
251	**8**	♄	5 33	6 21
252	**9**	M	5 34	6 20
253	**10**	Tu	5 35	6 18
254	**11**	W	5 36	6 16
255	**12**	Th	5 37	6 15
256	**13**	F	5 38	6 13
257	**14**	Sa	5 39	6 11
258	**15**	♄	5 40	6 09
259	**16**	M	5 41	6 08
260	**17**	Tu	5 42	6 06
261	**18**	W	5 43	6 04
262	**19**	Th	5 44	6 03
263	**20**	F	5 45	6 01
264	**21**	Sa	5 46	5 59
265	**22**	♄	5 47	5 58
266	**23**	M	5 48	5 56
267	**24**	Tu	5 49	5 55
268	**25**	W	5 50	5 53
269	**26**	Th	5 51	5 52
270	**27**	F	5 52	5 50
271	**28**	Sa	5 53	5 48
272	**29**	♄	5 54	5 46
273	**30**	M	5 54	5 44

Moon's Phases.

Full M., Sept. 4, 0 h. 55 m., morn.
Last Q., Sept. 11, 11 h. 51 m., eve.
New M., Sept. 18, 3 h. 55 m., eve.
First Q., Sept. 25, 1 h. 23 m., eve.

OCTOBER, 1895.

10th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
274	**1**	Tu	5 56	5 43
275	**2**	W	5 57	5 41
276	**3**	Th	5 58	5 39
277	**4**	F	5 59	5 38
278	**5**	Sa	6 00	5 36
279	**6**	♄	6 01	5 35
280	**7**	M	6 02	5 33
281	**8**	Tu	6 03	5 31
282	**9**	W	6 04	5 30
283	**10**	Th	6 05	5 28
284	**11**	F	6 07	5 27
285	**12**	Sa	6 08	5 25
286	**13**	♄	6 09	5 23
287	**14**	M	6 10	5 22
288	**15**	Tu	6 11	5 20
289	**16**	W	6 12	5 19
290	**17**	Th	6 13	5 17
291	**18**	F	6 14	5 16
292	**19**	Sa	6 15	5 14
293	**20**	♄	6 16	5 13
294	**21**	M	6 18	5 12
295	**22**	Tu	6 19	5 10
296	**23**	W	6 20	5 09
297	**24**	Th	6 21	5 07
298	**25**	F	6 22	5 06
299	**26**	Sa	6 23	5 04
300	**27**	♄	6 24	5 03
301	**28**	M	6 26	5 02
302	**29**	Tu	6 27	5 01
303	**30**	W	6 28	4 59
304	**31**	Th	6 29	4 58

Moon's Phases.

Full M., Oct. 3, 5 h. 47 m., eve.
Last Q., Oct. 11, 9 h. 34 m., morn.
New M., Oct. 18, 1 h. 10 m., morn.
First Q., Oct. 25, 6 h. 4 m., morn.

NOVEMBER, 1895.

11th MONTH. 30 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
305	**1**	F	6 30	4 57
306	**2**	Sa	6 31	4 56
307	**3**	☉	6 32	4 54
308	**4**	M	6 34	4 53
309	**5**	Tu	6 35	4 52
310	**6**	W	6 36	4 51
311	**7**	Th	6 37	4 50
312	**8**	F	6 38	4 49
313	**9**	Sa	6 40	4 48
314	**10**	☉	6 41	4 47
315	**11**	M	6 42	4 46
316	**12**	Tu	6 43	4 45
317	**13**	W	6 44	4 44
318	**14**	Th	6 46	4 43
319	**15**	F	6 47	4 42
320	**16**	Sa	6 48	4 41
321	**17**	☉	6 49	4 40
322	**18**	M	6 50	4 39
323	**19**	Tu	6 51	4 39
324	**20**	W	6 53	4 38
325	**21**	Th	6 54	4 38
326	**22**	F	6 55	4 37
327	**23**	Sa	6 56	4 36
328	**24**	☉	6 57	4 36
329	**25**	M	6 58	4 35
330	**26**	Tu	6 59	4 35
331	**27**	W	7 00	4 35
332	**28**	Th	7 02	4 34
333	**29**	F	7 03	4 34
334	**30**	Sa	7 04	4 34

Moon's Phases.

Full M., Nov. 2, 10 h. 18 m., morn.
Last Q., Nov. 9, 6 h. 6 m., eve.
New M., Nov. 16, 0 h. 11 m., eve.
First Q., Nov. 24, 2 h. 19 m., morn.

DECEMBER, 1895.

12th MONTH. 31 DAYS.

Day of Year.	Day of Month.	Day of Week.	N. Y. City. Sun rises. H. M.	N. Y. City. Sun sets. H. M.
335	**1**	☉	7 05	4 34
336	**2**	M	7 06	4 33
337	**3**	Tu	7 07	4 33
338	**4**	W	7 08	4 33
339	**5**	Th	7 09	4 32
340	**6**	F	7 10	4 32
341	**7**	Sa	7 11	4 32
342	**8**	☉	7 12	4 32
343	**9**	M	7 13	4 32
344	**10**	Tu	7 14	4 32
345	**11**	W	7 15	4 32
346	**12**	Th	7 15	4 32
347	**13**	F	7 16	4 33
348	**14**	Sa	7 16	4 33
349	**15**	☉	7 17	4 33
350	**16**	M	7 18	4 33
351	**17**	Tu	7 18	4 33
352	**18**	W	7 19	4 34
353	**19**	Th	7 20	4 34
354	**20**	F	7 20	4 35
355	**21**	Sa	7 21	4 35
356	**22**	☉	7 21	4 36
357	**23**	M	7 22	4 37
358	**24**	Tu	7 22	4 37
359	**25**	W	7 23	4 38
360	**26**	Th	7 23	4 39
361	**27**	F	7 23	4 39
362	**28**	Sa	7 23	4 40
363	**29**	☉	7 24	4 40
364	**30**	M	7 24	4 41
365	**31**	Tu	7 24	4 42

Moon's Phases.

Full M., Dec. 2, 1 h. 38 m., morn.
Last Q., Dec. 9, 2 h. 9 m., morn.
New M., Dec. 16, 1 h., 30 m., morn.
First Q., Dec. 24, 0 h. 21 m., morn.
Full M., Dec. 31, 3 h., 31 m., eve.

STANDARD TIME.

For the convenience of the traveling public, the railroads of the United States and the Dominion of Canada on the 18th of November, 1883, adopted an arrangement by which 5 time-standards take the place of the 54 previously used in preparing their time-tables.

The standards adopted with names by which they are distinguished, and their distance in longitude and consequent difference in time from Greenwich are shown by the following table.

Name.	Central Meridian		Hours.	
Intercolonial	60°	West	4	Slower
Eastern	75°		5	
Central	90°	from	6	than
Mountain	105°		7	
Pacific	120°	Greenwich.	8	Greenwich.

There are thus formed five "Time Belts," each comprising the area lying within 7½ degrees on each side of the different meridians, and measuring approximately 700 miles in breadth. In each of these time-belts, the standard time is one hour faster than in the adjoining time-belt on the West, and one hour slower than in that adjoining on the East. The boundary lines between the different time-belts are not strictly geographical, being arranged to correspond with important railroad points, as follows:—

Intercolonial Times is practically disregarded, as the country included lies so far to the eastward.

Eastern Time prevails over the whole section east of a line drawn from Buffalo, N. Y., through Pittsburgh, Pa.; Parkersburgh and Huntington, W. Va.; Bristol, Tenn., and Augusta, Ga., changing at these places (except Grand Trunk, of Canada, which changes at Sarnia) to

Central Time which extends to the irregular line drawn from Brandon, Man., through Mandan, Dak.; North Platte, Neb.; Dodge City, Kan., to El Paso, New Mexico. West of this line,

Mountain Time is in use, and covers the district up to another line, which, starting from Heron, Mont., passes through Ogden, Utah, to Yuma, Ariz.

Pacific Time is used from this line to the Pacific Ocean.

The Standards adopted by the Railroads have also been very generally adopted by the cities and towns throughout the country in place of the local time; from which it may differ by nearly thirty minutes fast or slow, according as the locality is east or west of the standard meridian. The exact *plus* or *minus* correction to be applied in changing from local to standard time or *vice versa* may be easily calculated in the following manner:—Reduce the longitude of the given locality to time (by dividing the degrees, minutes and seconds by 15, which gives hours, minutes and seconds) and subtract the longitude of the given meridian from it. For example, the longitude of Boston is 71° 4′ = 4h. 44m. 16s. Subtracting the longitude of the Eastern Standard Meridian 75° = 5h. from this, gives a *minus* result of 3° 56′ or 15m. 44sec. (say 16m.), as the difference by which Boston local meantime is faster than the Eastern Standard. In a similar manner, the local time of a place 3° 56′ West of the meridian, that is, long. 78° 56′ west, would be 15m. 44 sec. slow.

The following table gives the correction for a number of the principal cities of the continent.

Standard Time Table.

Correction to be applied to local mean time to obtain standard time.

	Standard	Correction.		Standard	Correction.		Standard	Correction.
		m.			m.			m.
Eastport, Me.	Intercol.	+28	Columbia, S. C.	Eastern.	+24	Memphis, Tenn.	Central.	———
Portland, Me.	Eastern.	—19	Columbus, O.	Central.	—28	Mobile, Ala.	"	— 8
Montpelier, Vt.	"	—10	Detroit, Mich.	"	—28	New Orleans, La.	"	———
Boston, Mass.	"	—16	Indianapolis, Ind.	"	—16	Austin, Tex.	"	+21
Springfield, Mass.	"	—10	Chicago, Ill.	"	—10	Cheyenne, Wyo.	Mount'n.	— 1
Providence, R.I.	"	—14	Springfield, Ill.	"	— 2	Denver, Col.	"	———
Hartford, Conn.	"	— 9	Galena, Ill.	"	+ 2	Santa Fé, N. Mex	"	+ 4
Albany, N. Y.	"	— 5	Milwaukee, Wis.	"	— 8	Helena, Montana	"	—23
New York, N. Y.	"	— 4	St. Paul, Minn.	"	+12	Virginia City, N.	Pacific.	— 2
Utiea, N. Y.	"	+ 1	St. Louis, Mo.	"	+ 1	San Francisco, C.	"	+10
Rochester, N. Y.	"	+11	Lawrence, Kan.	"	+21	Portland Ore.	"	+11
Philadelphia, Pa.	"	+ 1	Omaha, Neb.	"	+24	Quebec, Quebec.	Eastern.	—15
Harrisburg, Pa.	"	+ 7	Bismark, Dakota.	"	+43	Montreal, Quebec	"	— 6
Pittsburg, Pa.	"	+20	Savannah, Ga.	"	—36	Ottawa, Ont.	"	+ 3
Baltimore, Md.	"	+ 6	Milledgeville, Ga	"	—27	Toronto, Ont.	"	+18
Washington, D C	"	+ 8	Jacksonville, Fla.	"	—33			
Wheeling, W.Va.	"	+23	Louisville, Ky.	"	—18			

DIFFERENCE IN TIME (For Cable Purposes),

Between New York and some of the Principal Commercial Cities of the World. This Table is Approximate; the odd seconds are not given.

	H.M.		H.M.		H.M.		H.M.
Aden	7 56 F	Brussels	5.14 F	Gibraltar	4 35 F	Moscow	7.25 F
Alexandria	6.56 F	Buenos Ayres	1.02 F	Greenwich	4.56 F	Panama	.12 S
Algiers	5.08 F	Cadiz	4.27 F	Hamburg	5.36 F	Paris	5.02 F
Amsterdam	5.16 F	Calcutta	10.50 F	Havana	.33 S	Rio de Janeiro	2 03 F
Antwerp	5.13 F	Canton	11.31 S	Hong Kong	11.27 S	Rome	5.46 F
Athens	6.31 F	Cape Town	6.10 F	Lisbon	4.19 F	St. Petersburg	6.57 F
Bahia	2.34 F	Christiania	5.39 F	Liverpool	4.44 F	Stockholm	6.08 F
Berlin	5.50 F	Constantinople	6.53 F	London	4.56 F	Sidney	9.59 F
Berne	5.26 F	Copenhagen	5.46 F	Madrid	4.42 F	Valparaiso	.10 F
Bombay	9.48 F	Dublin	4.31 F	Melbourne	9.14 F	Vera Cruz	1.29 S
Bordeaux	4.53 F	Edinburgh	4.43 F	Mexico City	1.40 S	Vienna	6.01 F
Bremen	5.31 F	Geneva	5.21 F	Montevideo	1.11 F	Yokohama	10.45 S

F—*Fast of N. Y. Time.* S—*Slow of N. Y. Time.*

The difference in time is calculated on actual New York Mean Time, 74° of longitude west of Greenwich. For the new Standard Time, 75th Meridian west of Greenwich, for places west of New York, subtract 4 minutes; for places east of New York, add 4 minutes.

LEGAL HOLIDAYS IN THE VARIOUS STATES.

January 1. New Year's Day: In Alabama, Arkansas, California, Colorado, Connecticut, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Michigan, Missouri, Nevada, New Jersey, New York, North Carolina, North Dakota, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, West Virginia, Wisconsin, and Wyoming.

January 8. Anniversary of the Battle of New Orleans: In Louisiana.

* February 22. Washington's Birthday: In Alabama, California, Colorado, Connecticut, Georgia, Idaho, Illinois, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Pennsylvania, Rhode Island, South Carolina, South Dakota, Texas, Utah, Virginia, Wisconsin, and Wyoming.

February 26. Mardi Gras: In Louisiana.

March 2. Anniversary of Texan Independence: In Texas.

March 4. Firemen's Anniversary: In New Orleans, La.

April 12, 1895. Good Friday: In Louisiana, Maryland, and Pennsylvania.

* April 21. Anniversary of the Battle of San Jacinto: In Texas.

* April 26. Memorial Day: In Georgia.

May 30. Decoration Day: In California, Colorado, Connecticut, Iowa, Illinois, Kansas, Kentucky, Massachusetts, Michigan, Nevada, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Dakota, Utah, Vermont, Wisconsin, and Wyoming.

July 4. Independence Day: In all the States except Nebraska.

September 2, 1895. Labor Day: In Colorado, Connecticut, Illinois, Iowa, Kansas, Maine, Massachusetts, Montana, Nebraska, New Hampshire, New Jersey, New York, Ohio, Oregon, Pennsylvania, and Tennessee.

November 5, 1895. General Election Day: In California, Kansas, Maryland, Missouri, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oregon, South Carolina, South Dakota, and Wisconsin.

November 28, 1895. Thanksgiving: Is observed in all the States, though in Nebraska and some others it is not a statutory holiday.

December 25. Christmas Day: In all the States except Nebraska.

Sundays and Fast Days (whenever appointed) are legal holidays in nearly all the States.

Arbor Day is a legal holiday in Nebraska, Idaho and Kansas, the day being set by the Governor. Arbor Day is also a legal holiday in Rhode Island, but does not affect the payment of notes, etc.

In Minnesota, Washington's Birthday is the only general holiday expressly provided by law. As to the maturity of bills and notes, the following days are by implication holidays: Thanksgiving Day, Good Friday, Christmas, January 1st, and July 4th; as to schools—Christmas, January 1st, July 4th, Memorial Day, and Thanksgiving Day.

In New Mexico, there are no legal holidays established by statute.

Every Saturday after 12 o'clock noon is a legal holiday in New York.

* *NOTE.*—Holidays falling on Sunday are usually kept on the Monday following.

WEATHER INDICATIONS.

Sunset Colors.—A gray, lowering sunset, or one where the sky is green, or yellowish green, or any unusual color, indicates rain. A red sunrise, with clouds lowering later in the morning, also indicates rain.

Halo (Sun Dogs).—By halo we mean the large circles, or parts of circles, about the sun or moon. A halo occurring after fine weather indicates a storm.

Corona.—By this term we mean the small colored circles frequently seen around the sun or moon. A corona growing smaller indicates rain; growing larger, fair weather.

Rainbows.—A morning rainbow is regarded as a sign of rain; an evening rainbow, of fair weather.

Sky Color.—A deep blue color of the sky, even when seen through clouds, indicates fair weather; a growing whiteness, an approaching storm.

Fog.—If arising in morning, indicates fair day; if forms during night, indicates unsettled conditions. A morning fog usually breaks away before noon.

Visibility.—Unusual clearness of the atmosphere, unusual brightness or twinkling of the stars, indicates rain.

Clouds.—In observing clouds, we observe their kinds, motions, and outlines. The clouds frequently called "mare's tales" we term Cirri. They are marked by their light texture, fibrous and sundered as in the "mare's tail," or interlacing, as in the far-spreading white cloud, which produces the halo. Small, regularly formed groups of these clouds are frequently seen in fair and settled weather. The Cirri are also the clouds on the forepart of the storm. In this case they are usually more abundant, their outline is very ragged, and they gradually blend into a white, far-reaching cloud bank. The cloud well known as "cotton bales," or "thunder heads," we term cumulus. When they appear during the heat of the day and pass away in the evening, continued fair weather may be expected. When they increase with rapidity, sink into the lower part of the atmosphere, and remain as the evening approaches, rain is at hand. If loose patches appear thrown out from their surfaces, showers may be expected. The clouds usually seen after nightfall, lying in one horizontal plane, and not of great extent, are attendant on fine weather. Small, black, inky clouds and dark scud indicate rain.

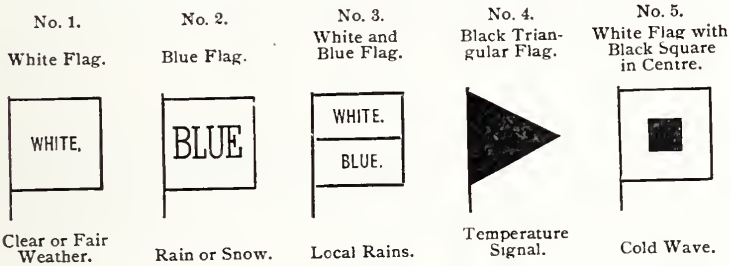
Frost.—The first frost and last frost are usually preceded by a temperature very much above the mean.

EXPLANATION OF THE FLAG AND WHISTLE SIGNALS

ADOPTED BY THE UNITED STATES WEATHER BUREAU.

1. The Weather Bureau furnishes, when practicable, for the benefit of the general public and those interests dependent to a greater or less extent upon weather conditions, the "Forecasts" which are prepared daily, at 8 A M. and 8 P.M., for the following day. These weather forecasts are telegraphed by observers at stations of the Weather Bureau to railway officials, and many others, and are so worded as to be readily communicated to the public by means of flags or steam whistles. The flags adopted for this purpose are five in number, and of the form and dimensions indicated below:

EXPLANATION OF FLAG SIGNALS.



Number 1, white flag, six feet square, indicates clear or fair weather. Number 2, blue flag, six feet square, indicates rain or snow. Number 3, white and blue flag (parallel bars of white and blue), six feet square, indicates that local rains or showers will occur, and that the rainfall will not be general. Number 4, black triangular flag, four feet at the base and six feet in length, always refers to temperature; when placed above numbers 1, 2, or 3 it indicates warmer weather; when placed below numbers 1, 2, or 3 it indicates colder weather; when not displayed, the indications are that the temperature will remain stationary, or that the change in temperature will not vary more than four degrees from the temperature of the same hour of the preceding day from March to October, inclusive, and not more than six degrees for the remaining months of the year. Number 5, white flag, six feet square, with black square in centre, indicates the approach of a *sudden* and *decided* fall in temperature. This signal is not to be displayed unless it is expected that the temperature will fall to 42 degrees, or lower, and is usually ordered at least twenty-four

hours in advance of the cold wave. When number 5 is displayed, number 4 is always omitted.

2. When displayed on poles the signals should be arranged to read downward; when displayed from horizontal supports a small streamer should be attached to indicate the points from which the signals are to be read.

Interpretation of Displays.

No. 1, alone, indicates fair weather, stationary temperature.
No. 2, alone, indicates rain or snow, stationary temperature.
No. 3, alone, indicates local rain, stationary temperature.
No. 1, with No. 4 above it, indicates fair weather, warmer.
No. 1, with No. 4 below it, indicates fair weather, colder.
No. 2, with No. 4 above it, indicates warmer weather, rain or snow.
No. 2, with No. 4 below it, indicates colder weather, rain or snow.
No. 3, with No. 4 above it, indicates warmer weather with local rains.
No. 3, with No. 4 below it, indicates colder weather with local rains.
No. 1, with No. 5 above it, indicates fair weather, cold wave.
No. 2, with No. 5 above it, indicates wet weather, cold wave.

Explanation of Whistle Signals.

3. Note.—The warning signal, to attract attention, will be a long blast of from fifteen to twenty seconds' duration. After this warning signal has been sounded, long blasts (of from four to six seconds' duration) refer to weather, and short blasts (of from one to three seconds' duration) refer to temperature; those for weather will be sounded first.

Blasts.	Indicate.
One long	Fair weather.
Two long	Rain or snow.
Three long	Local rains.
One short	Lower temperature.
Two short	Higher temperature.
Three short	Cold wave.

Interpretation of Combination Blasts.

One long, alone	Fair weather, stationary temperature.
Two long, alone	Rain or snow, stationary temperature.
One long and one short	Fair weather, lower temperature.
Two long and two short	Rain or snow, higher temperature.
One long and three short	Fair weather, cold wave.
Three long and two short	Local rains, higher temperature.

(By repeating each combination a few times, with an interval of ten seconds between, possibilities of error in reading the forecasts will be avoided, such as may arise from variable winds, or failure to hear the warning signal.)

4. As the weather forecasts are telegraphed daily to a large number of stations of the Weather Bureau, to railroads, etc., in various sections of the country, there are many small towns which may obtain them by telephone, free of expense; they may also be obtained from the Associated Press dispatches published in daily newspapers. Those desiring to display or sound the signals, and who are not able to obtain the forecasts as above, should communicate direct with the Director of the State Weather Service, or with nearest observer, when, if practicable, the predictions will be telegraphed to them at the expense of the Weather Bureau; and if it is impracticable for the United States to bear the expense of transmission, they will be furnished at the regular commercial rates and sent "collect"; forecasts may also be obtained from any daily paper.

5. In no case will both A.M. and P.M. forecasts be sent to the same address at Government expense; nor will the telegrams be sent to more than one person, or firm, in any one place, except at the expense of the applicant.

6. Flag weather signals are displayed at many stations throughout the United States, and this improved system has been adopted with the view of securing uniformity, and is recommended after a careful test. The method is not complicated; the solid colors insure legibility, and the flags may be obtained at small expense, or, if desired, material may be procured, and the symbols be of home manufacture, no restriction being placed upon the size of the flags used, so long as they conform to the system above outlined, but no flags should be less than six feet square.

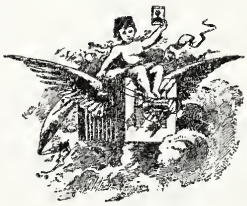
7. The system of whistle signals may be utilized to better advantage in many places where flags could not be seen at long distances, due notification having been given to the surrounding community through the press and otherwise that, at a designated hour, the steam whistle at a certain place will sound the signal to indicate the probable weather and temperature for the ensuing twenty-four hours.

8. The flag displays here outlined may be greatly extended and become one of the most valuable aids to farmers, shippers, and the public generally, by a little exertion and a small outlay for flags on the part of those who would be benefited. The system has been adopted and is in use by some of the principal railroads throughout the country, the symbols, made of tin or sheet iron, being displayed from the baggage cars. These roads transmit over their wires each morning, to points from which trains start, the names of the symbols to be displayed, the baggage-master at those points attaching them. When the symbols are displayed on the cars they

should be placed one above the other and read downward. Many large firms and corporations are exhibiting the flags, and at the same time advertising their business by printing the signals and their meanings on the back of their business cards.

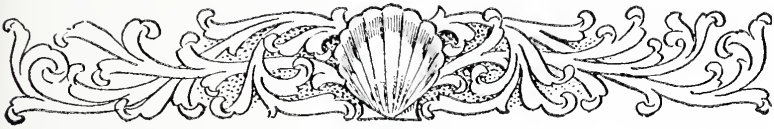
9. There being but a limited appropriation at the disposition of the Chief of the Weather Bureau for the purchase of flags, it is necessary that the utmost care be used in their distribution in order that they may be placed in proper hands where they will be properly cared for as Government property and only used for the purpose for which they are intended. In many instances individuals, or firms, receiving the forecasts at Government expense manufacture or procure their own signals for such displays; those desiring to take such action in their individual cases may purchase the flags from several firms at various prices. dependent upon the quality of the material used in their construction.

WASHINGTON, D. C., August 8, 1894.



PHOTOCHROME ENG. CO. ALFRED STIEGLITZ.

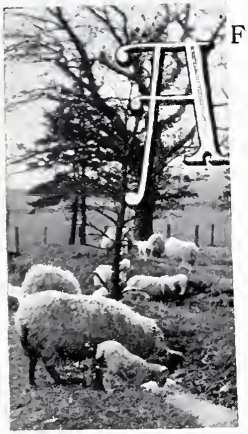
"OUTWARD BOUND."



The American Annual of Photography and Photographic Times Almanac, 1895.

A PLEA FOR A PHOTOGRAPHIC ART EXHIBITION.

BY ALFRED STIEGLITZ.



By C. Reid

AFTER having patiently watched and closely looked into the various photographic exhibitions of the past few years which were held in the United States, and not having noticed any decided step forward in the management of said exhibitions, it is the writer's opinion that the time has arrived for us Americans to hold an exhibition worthy of the name *Art Exhibition*. In England, in Austria, in Paris, and everywhere where picture photography has been recognized as an art, exhibitions have been held with remarkable success. These exhibitions have been run upon the strictest lines, pictures were hung upon their merits only, and these merits had to be of no mean order at that.

The writer distinctly remembers how Messrs. Srna, Scolik, Mallmann and others, of the Viennese Camera Club, talked about a Photographic Salon as early as 1889, and how they were laughed at at first. But these gentlemen were not to be discouraged by petty sneerers, and, going ahead with the courage of their convictions, they soon had the whole

Club interested in the work, and, as we all remember, the Viennese Photographic Salon was a huge success and a triumph for picture photography.

In England this example was soon followed with equal suceess, and then Paris followed suit.

And we here in the United States! What have we done? We continue upon the same old lines, shrug our shoulders with a self-satisfied air and remark: "That may be all right abroad, but we can never have an exhibition run upon such lines here." Let me tell you that I do not agree with you—that I saw the same shrugging of shoulders abroad—the same dubious smiles—the same self-satisfied air—and still triumphant results! We Americans cannot afford to stand still; we have the best of material among us, hidden in many eases; let us bring it out. Let us make up our minds that we are equal to the occasion, and prove to the photographic world at large that we are awake and interested in the progress of picture photography. Abolish the joint exhibitions, which have done their work and served their purpose, and let us start afresh with an *Annual Photographic Salon*, to be run upon the *strictest* lines. Abolish medals and all prizes; the acceptance and hanging of a picture should be the honor. There is no better instructor than public exhibitions.

Let all of those interested in this matter combine and go to work *at once*. The Editors of the PHOTOGRAPHIC TIMES ANNUAL will certainly lend a helping hand in this serious matter, and the writer will, with much pleasure, sacrifice time and money in order to bring about a revolution in photographic exhibitions in the United States.

By C. R. Pancoast.

A BIT OF MONTAUK.

PHOTOGRAPHY FOR AMATEURS IN JAPAN.

BY PROF. W. K. BURTON.

FIG. 1.

I HAVE more than once written of Japan as a happy hunting ground for the amateur photographer, and it remains such, becoming in one respect, at least, happier as time goes on, for while, six or seven years ago, it was not possible to obtain any but a very meagre supply of photographic requisites, the supply is now really very fairly good, and with the exception of a few of the latest "fancies" one is generally able to get whatever he wants.

None seem to appreciate the amenities of the amateur photographer here more than such travelers with the camera as have arrived in this country, having taken China on their way. In China the inhabitants put every obstruction in the way of the "foreign devil." Indeed, photography by "white men" is not carried on without danger there, except in the foreign settlements, though perhaps a late writer on the subject showed himself to have been a little over-timid when he stated that he never put his head under the focusing cloth without a creepy feeling that he might be stabbed in the back before he had finished focusing.

It is just the contrary in Japan. There is no country in the world where the amateur meets with so little obstruction and molestation, or receives so much willing help. I have only once been interfered with during seven years of constant work with the camera here. That was when I was photographing the main entrance to the emperor's palace.

A guard came up and politely informed me that he did not know whether it was permissible to photograph the semi-sacred building. I gave him my card and asked him to be so good as to inquire. By the time he returned with word that there was no objection to photographing where I was, I was enabled to assure him, with thanks, that I had already made all the exposures I wanted to.

There is, at present, a great "anti-foreign reaction" in Japan, but it evinces itself nearly entirely in the frothy writings of newspapers, managed by unfledged youths, whose knowledge of things in general is sadly hampered by limits, or by Members of Parliament whose sole aim is to embarrass the government, or who, being ignorant peasants, still believe that "Great Japan" contributes the major part of the world, and that all foreigners are outer barbarians.

Fig. 2.

Reports about its "being unsafe to walk the streets," and so forth, are mere buncombe. If, in this city of 1,300,000 souls, a tipsy student hustles a foreigner in the street (the thing has happened about twice within a year), by the time the report reaches the *London Times*, it is represented that it is necessary for foreigners to go about armed to the teeth, and that it is not safe to walk the streets, "especially for women and children."

As a matter of fact, except for drunken sailors and missionaries, Japan remains, as it has been since a few years after the restoration, perhaps, of all countries in the world, the one where life and property are the safest, and the traveler or tourist, at any rate, will experience no effect whatever from the "anti-foreign reaction," but will find the people kind, courteous, obliging and helpful, and this the

more so the farther away he can get from the open ports and the beaten tracks of the "globe-trotter." On drunken sailors the coolies of the open ports have a special "down," probably an account of the pretty little ways of the sailor when he is merry. It is then his delight to black the eyes of a few coolies, and to knock the teeth of a few more down their throats. Some missionaries seem to exhibit a peculiar capacity for clashing with the people.

A few hints may be useful here to any intending to bring a camera here. The best sizes to work are 4¼ x 3¼, 5 x 4, or 6½ x 4¾, unless the amateur is enthusiastic enough to carry a 12 x 10 camera with him, as intermediate sizes are not always in stock. Indeed, 5 x 4 is not kept in stock, but some dealers are so well accustomed to cutting from 12 x 10, that such cut plates can be thoroughly relied on. It is, of course, necessary, in this case, to purchase not less than half gross of the cut plates at a time.

FIG. 3.

The Duke of Newcastle and Mr. Gambier Bolton, who were here last year, worked both 10 x 8 and 5 x 4 sizes with which they could readily be supplied, as one 12 x 10 plate will cut into one 10 x 8 and two 5 x 4. The ease with which porters and pack horses can be had in Japan, and the moderate charges, makes the carrying of a 12 x 10 outfit a much less serious thing than it is in most countries. The writer does not think much of traveling in the country with one outfit for 18 x 14 and one for 12 x 10.

The largest stock dealers are Konishi and Asanuma, who have establishments in both Tokyo and Osaka. As regards the open ports, the foreign druggists at Kobe keep a fair stock of both chemicals and apparatus. In Yokohama Mons. Favre Brandt has a good stock of apparatus, but it will probably be found best to go to Konishi or Asanuma in Tokyo

for chemicals, paper, etc. I do not know what may be the facilities for purchasing photographic goods in Nagasaki or Hakodate.

As to the best kind of work to come prepared to do there is not much use in giving advice, because, however good advice may be, folks very seldom pay any attention to it. I may say, however, that the work that has been least completely carried out here is *really good* hand camera work of street scenes and the like.

Baron Stillfried, of Stillfried & Anderson, Count Farsari, of Farsari & Co., and a host of talented Japanese photographers, have "done" the landscape photography of Japan so thoroughly and well that, unless a tourist is to be at least several months in the country, he will find it better to buy photographs than to make them, especially considering the remarkably low prices. Excellent 12 x 10 prints cost from ten to twenty cents, gold. The same may be said of figure subjects as of landscapes.

Fig. 4.

In hand-camera work it is different. Heaven knows we are visited by plenty of the wretched army of "snap shotters," the miserable creatures who have not begun to learn that the use of a hand camera needs all the skill that is necessary in using a tripod camera, *and a good deal more thrown in*, but of really good hand-camera work we have had comparatively little. The professionals have hardly touched it. Of the resident amateurs only one—Mr. Otis A. Poole, an American—is the only one who has really applied himself industriously to turning out first-class hand-camera work. The results of the work of the few really skilled photographers who have visited this country with hand-cameras I have not yet seen, but whatever these results may be, there is infinite scope for the hand-

camera man still in the streets here, the more especially as the streets are, in warm weather, the play-grounds of the children, who amuse themselves out of doors rather than in the houses whenever possible. They form the quaintest and prettiest of groups, with their curious head dresses and, to us at least, odd clothing, or often, so far as the last mentioned item is concerned, its complete absence.

It is worth mentioning that the *very* rapidest plates are not stocked here, as they cannot be relied on to keep. Plates quick enough for all but very exceptional work are, however, to be had. The summer climate of Japan ruins rolled films in a month or two. Cut films seem to keep as well as plates.

Fig. 5.

Now to give your readers, if I can, something that may be a bit characteristically Japanese: I select, to begin with, a few illustrations of the kind of wrestling called here *sumo*, a peculiarly national sport. I have heard *sumo* described as "brutal." Well, if there is anything essentially brutal in seeing two men clothed in loin-cloths only, or if any trial of strength whatever between men is brutal, then is *sumo* brutal, but not otherwise. Not to mention boxing, *sumo* is less liable to lead to hurt than any Western style of wrestling. Indeed, I have never heard of a *sumo* receiving any worse hurt than a bruise or an abrasion of the skin. Moreover, the life of these professional *sumo* (the same word describes the wrestler and the wrestling) is very different

from that of a professional boxer, or any of that class who, in Western countries, I believe, with a few honorable exceptions, spend their lives in alternate spells of more or less riotous living, and of terribly severe training. The life of a *sumo* is a very quiet one, and, after he has become a full-fledged wrestler, he submits to no special training except his daily bout in the ring. He belongs, moreover, to a guild, to which he subscribes, and which cares for him when he is superannuated.

The first illustration I give you is that of Taiho, or Ozutsu, with myself standing alongside of him. The names I have just given both mean "cannon," and certainly Taiho is a great gun. As you see him, his wooden clogs give him an advantage in height over myself, in boots, of 1¼ inches, but even discounting this it will be seen that he is an enormous man.

Fig. 6.

Some time ago there were published here—copied from the New York *World*, I think—comparative measurements of Corbett and Mitchell. I made corresponding measurements of Taiho and found that, except in the matter of neck and "reach," the latter was in every case larger than either of the famous pugilists. I have, unfortunately, lost the notes made, but the following I remember:

Height (with bare feet)	6 feet 4 inches
Chest measurement	4 feet ½ inch
Weight	400 pounds

With regard to this enormous weight, it is to be observed that pure weight alone gives a wrestler in Japanese style a great advantage, and that all try to put on as mueh flesh—and excepting the legs and arms—as much fat as they can.

The wrestling consists in giving any of a certain number of "throws," or of shoving the opponent out of the ring, which is about 14 feet in diameter and has no rope round it, but is marked by a slightly raised circle of hard beaten earth. A man can shove one much lighter than himself out of the ring by "dead weight" alone.

Taiho is not the champion of Japan, but is high up among the most famous wrestlers. The name of the champion is Nishinoumi, and I give three photographs of him

Fig. 7.

here (Figs. 2, 3, 4). He is not by any means the giant that Taiho is, being under six feet high. His superiority comes from skill, and from the enormous strength of his arms and legs, especially the latter. It will be seen how he stands, as on two massive columns. The attitudes are two of a number gone through in a kind of dancing, or, rather, posturing, that wrestlers go through at certain parts of the performance. The great rope about Nishinoumi's waist is the badge of championship. The apron, gorgeous in purple and gold, is a trophy of victory.

The next print (Fig. 5), shows a couple of *sumo* watching for a "grip," and the one after it, a pair after they have got a grip. The comical looking individual with the fan is the umpire, who keeps dodging round to see that no improper grip is taken and that no foul fall is given. He chants the name of the victor in a loud voice at the end of the bout.

The wrestlers travel about in great bodies from town to town. The performance takes place in a ring in the centre of a huge circus-like structure, and lasts from early morning till late in the afternoon, pair after pair coming on. When two famous or popular *sumo* are wrestling the excitement becomes intense. Members of the audience throw them over mantles, or other articles of dress, toward the ring, and afterward redeem them by a small present of money to the victor.

Fig. 8.

The photographs I send were taken in my own garden, and after I had made the negatives I gave my guests a feed of "foreign chow." The way that beefsteaks, fowls and all, and sundry, disappeared was a marvel to behold. The wrestlers also drank both beer and whiskey copiously—one, I noticed, preferring to *mix* the two!—but the liquor seemed to have absolutely no effect on them.

I found these great lumps of humanity mild and gentle in their manners, good-natured to a degree, and evidently on the best of terms with one another. They all seemed to be particularly fond of children.

The next pictures (Figs. 7, 8), I show are of a very different subject. They show a set of girls around the "hibachi," or

fire-box, that constitutes the most prominent feature of the furniture of every Japanese room, otherwise nearly quite furnitureless. Two of the party are playing a game of *ken*, a forfeit game much affected by young people of both sexes.

The game, in its very simplest form and known as janken, is played in the following way: The two players, sitting on the floor opposite to each other, clinch each the fist of the right hand, and say together "*hi*,* *fu*, *mi*."† These words are contractions for the *true* Japanese of one, two, three. At "hi" and "fu" the right arm is waved, at "mi" the right

FIG. 9.

hands are quickly brought within a foot or two of each other, and in each case either (1) the fist is still closed, (2) the hand is open, the fingers widely spread, or (3) the first and second fingers are held wide apart like a pair of shears, the others are held in the palm of the hand. The purports of these three arrangements of the fingers are (1) a stone, (2) a sheet of paper, and (3) a pair of scissors. To explain the game, I

* Pronounced like the English word "he," or in the Tokyo dialect like the word "she."
† Pronounced like the English word "me."

ask your printer to print the three words thus, forming a triangle:

STONE

PAPER SCISSORS

The theory is that the stone defeats the scissors because the latter can be ground by the former, the scissors defeats the paper because the former can cut the latter, but the paper defeats the stone because in the paper the stone can be wrapped!

It will be seen that no two can be indicated, but that one must defeat the other.

In another form of the game known as "to-hachi-ken" much more elaborate gestures are made, and the game takes some little time. In this form of the game the cycle is as follows:

MAN

FOX GUN

The theory of this case is as follows: The man can fire off the gun, the gun can kill the fox, but the fox can bewitch* the man.

This form of the game is particularly affected by geisha (professional singing and dancing girls), who accompany the gestures—with them very graceful—by extremely lively kind of singing or recitative, and who show extraordinary skill in detecting, by minute indications, quite imperceptible to the unpracticed, the movements their opponents are about to make. No ordinary individual has the faintest chance against one of these girls.

The forfeit is generally something very trifling; the looser must quaff a thimbleful of sakè, go through some absurd antic, have her face sun-dyed with a spot of Chinese ink, or the like. There is, however, a very different variety of the game exhibited in the open ports *for the special delectation of foreigners, and of them only.* In this the vanquished has to give up first her hair pins, one by one, then her comb, and after that, one article of dress after another till, in the end, to

* The belief in bewitchment by foxes is a very old one in Japan, and is one still firmly held by the uneducated classes.

By F. R. Ziel.

MOONLIGHT PHOTOGRAPH.

Night festival at the Encinal Boat Club, Alameda, Cal. Taken by moonlight, at 10.30 P.M.; exposure, 40 minutes. The fireworks were set off during the last 5 minutes of the exposure. Moon's declination, 25° South.

put it mildly, one of the two is but scantily clothed—and not much in her right mind either!

The last picture represents a dancing lesson. At the two sides are the musicians, one playing the samisen, a sort of banjo, the other the koto, a somewhat primitive harp, while in the middle a maiko, or "half (trained) geisha" practices a kind of posturing, in which the motion of the fan is of great importance, and which is generally termed "dancing," though it is very different from anything that we call by that name.

PORTRAITURE BY ORDINARY WINDOW LIGHT.

BY W. S. WATERBURY.

IN making portraits by ordinary window light, we are apt to encounter some serious difficulties.

The greatest one is that there is too much contrast between the lights and shadows, the lights being far too dense and the shadows much too thin, almost, in fact, devoid of detail.

This trouble arises from the fact that there is an excess of light on one side and a deficiency on the other side, and in developing a negative made under these conditions, in the attempt to obtain detail in the shadows, the high-lights are hopelessly over-developed.

It is obvious, then, that there are *two* errors to correct—the light must be subdued on one side and increased on the other.

But before going any farther let us consider what is necessary in order to produce the ideal portrait.

First, there must be roundness, which will depend on the half-tones being correctly rendered, that is, having a gradual blending of the light, from the high-lights to the shadows.

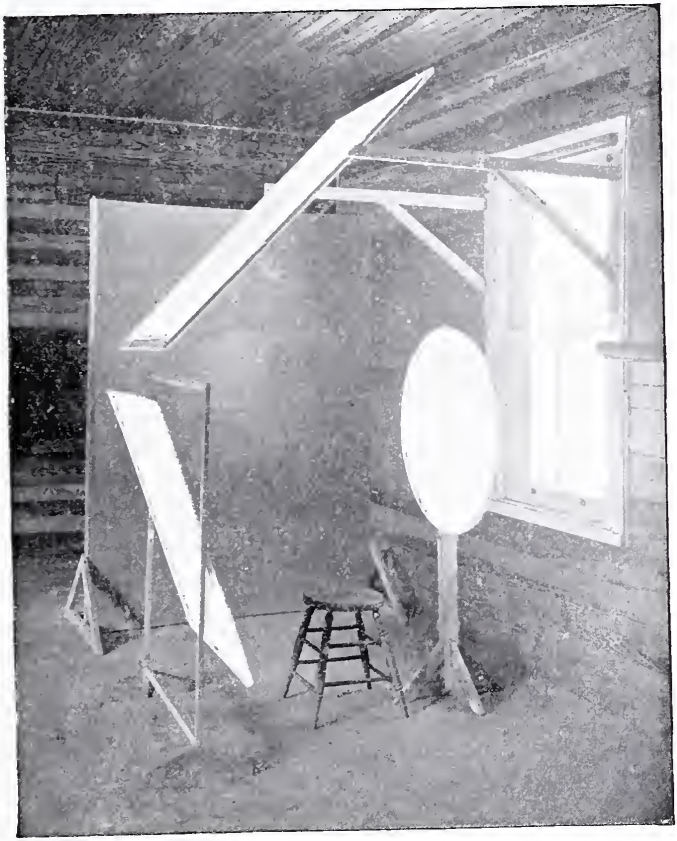
Next, there must be detail, which depends upon proper exposure and development.

Then softness, and this will depend to a great extent on the lens and development, principally the latter, being careful to avoid over-development. If any error *is* made, let it be on the side of *under*-development.

Some prefer a portrait a little out of focus, others prefer

a microscopical sharpness, but the choice is left to the option of the operator.

If sharpness is desired, use your rectilinear lens, moderately stopped down, but if softness is preferred, then use the



ARRANGEMENT FOR PORTRAITURE BY ORDINARY WINDOW LIGHT.

portrait lens, or the rectilinear with full opening, and do not focus too carefully.

Now as to how the above-mentioned errors in lighting can be corrected.

The first-mentioned, that of having an excess of light on one side, can be remedied by interposing a round screen

between the sitter and the window, made by covering an ordinary hoop, about 2½ feet in diameter, with white cheese cloth, and mounting it on a stand.

This will modify the light on that side of the face, and will contribute largely toward avoiding the sharp contrasts.

The latter, that of having a deficiency of light on the shadow side of the face, can be remedied by reflecting the light from the same window (and by the way there should be no other source of light in the room) by an arrangement of reflecting screens, which is shown in the accompanying cut.

First make a white muslin screen about the width of the window, and swing it between the arms projected from the top of the window casing, and allow it to be movable, so that it can be inclined at different angles.

This will reflect the light on the top of the head and upper part of the face.

Then make another screen about the same size, or smaller, depending on the height of the window, and swing this one in a standing frame, having its centre about as high as the sitter's head.

By inclining this one at the proper angle it will reflect the light on the lower part of the face, and in those parts not lighted by the one above, such as under the eyes, nose and chin.

A glance at the cut will describe the entire arrangement.

By a variation of the angles of the two screens, almost any effect can be produced, and with a suitable background, which can be made by covering a frame with muslin and giving it a coat of light gray kalsomine, successful portraits can be produced that compare favorably with those made under a skylight.

In my experience I have found that the best results are obtained by using a room, not lower than the second story, and the light not interrupted, no buildings or trees intervening, but in all cases avoid *all* sunlight in the room.

The proper angles of the screens must be determined by experiment, as the light varies at different windows, but by watching carefully the different effects produced by varying the angles of the screens, one will soon learn just what angles are required.

THE MUSLIN BLUE PRINT.

BY J. WILL BARBOUR.

THE simplest photographic printing process of which we have any knowledge is the cyanotype, or, as it is more commonly called, the "blue-print."

Unlike many other processes, the cyanotype can be printed on cotton fabrics as well as on paper, thus giving us the power of producing pictures or designs in blue and white, on muslin or similar cloth, at a surprisingly small cost.

Among the many standard formulæ to be found in another part of this volume is that for the cyanotype. The ingredients cost very little, and can be had at any first-class drug store. The quantity mentioned in the formula will sensitize many square yards of surface.

Nothing can be more simple than the method of preparing the cloth for printing. All that is necessary is to sponge it with the mixed solution, and hang it up to dry. Care must, of course, be taken to protect it from the light, during and after the sensitizing, and the bottles containing the unmixed solutions should also be kept in a dark place.

The printing is done the same as on paper, although a much more thorough after-washing is necessary than is required for the paper print. Boiling water can be used to remove the last traces of the chemicals, although no soap should be allowed to come in contact with it, as it will fade out the blue. A few drops of an organic acid added to the first wash water will increase the brilliancy of the result.

Let us look at some of the uses to which the muslin blue-print can be put. In these days of keen competition, novelties in advertising are always in demand. The rural wayside advertisement, although looked upon with disfavor by many, is still extensively used, and I know of no more attractive novelty in that line than the bright blue and white of the cyanotype. Paper is cheaper than muslin, but is soon

beaten down by rain and lost; but the muslin print, if securely tacked to a flat surface, will withstand the attacks of all kinds of weather, and will look well for a long time. Care must be taken, however, not to post them against a whitewashed surface, as the alkaline lime water that would soak into them in wet weather would fade them in the same manner as the soap would have done.

Negatives of any size, to print any words or designs, can be produced in the following easy manner, without the aid of a camera:

Take a piece of glass of the required size, and if it is desired to produce white lettering on a blue ground, cut the words out of opaque paper—the black paper that is used in packing some brands of dry plates is just the thing—and paste them right side down to the glass; or if blue letters on a white ground are wanted, the paper can be pasted all over the glass, and the letters cut away with a sharp knife. From such negatives prints are taken in exactly the same way as from photo plates, and, being absolutely transparent and opaque, will give better contrasts and more vigorous prints than could be had from a chemically produced negative.

Another use for the process, that will be of special interest to the lady readers of the ANNUAL, is in printing pictures or designs on cloth for fancy household decoration.

The "crazy-quilt" fad has had its day, but the desire for novel and unique bed-coverings is as great now as in the days when the "log cabin" and "pineapple" quilts of our grandmothers were wont to draw premiums at the county fairs.

A striking novelty in the quilt line can be made by decorating the patches with bright blue and white designs, printed as before described. By the exercise of a little skill in handling the scissors and paste-brush, any geometrical design or other device can be produced in negative, and the required number of patches printed from it.

The emblems of societies can be used in this way in decorating articles to be disposed of at fairs; ribbons for badges can be lettered in blue and white, mats and tidies can be decorated from landscape negatives, and many other uses for the process found upon a moment's thought.

When only one print of any design is required, the sensitized cloth can be tacked to a board, and the paper pattern pasted upon its surface, after which the printing can be done by simply exposing it to light. The paper will, of course, soak off as soon as the cloth is put in water, and the design will be found quite as sharply printed as if made in the regular way. This is a good makeshift when no printing-frame can be had.

The cheapness and ease of manipulation of the muslin blue-print process, and the great number of different uses that can be found for it, will no doubt cause many to experiment in this line, and I would be pleased to hear through the *Times* of any triumphs that may be achieved in this direction.

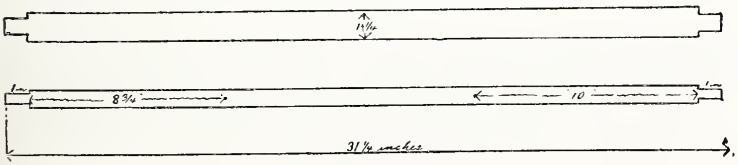
"A POSING CHAIR."—HOW TO MAKE.

BY DAVID G. ARCHIBALD.

THE photo-engraving accompanying this article will give an idea of the appearance of a posing chair brought from Venice by an American artist, and the description following, the way in which one can be made at a slight expense.

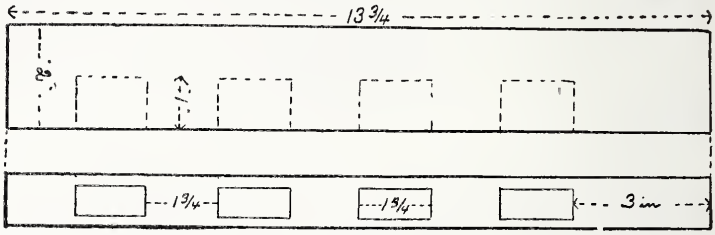
Have the following pieces of wood made of ash ¾ of an inch thick.

1. Sides. Eight (8) of a length of 31⅛ inches and breadth of 1¾ inches, with ends tongued to the depth of 1 inch, to fit into 2 and 2a, as will be hereafter explained. Two holes to be drilled through breadth 3-16 or ¼ inch in diameter, as per cut of side.



SIDE PIECE.

2. Bottom of sides. Two (2) pieces 13⅝ inches long, 2 inches wide, with four (4) holes (as per cut 2) 1 inch deep for the tongued ends of sides to fit into. First one to be 1¾

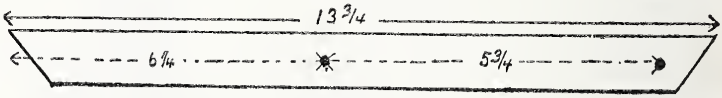


BOTTOM AND TOP OF SIDES.

inches from end, 1¾ inches wide, the 3 others to be the same, allowing 1¾ inches between them, there being a projection of 3 inches on one end.

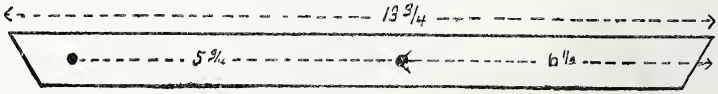
2a. Top of sides. Two (2) pieces the same as 2, with one edge rounded as cut 3.

3a. Seat Pieces. Four (4) of these 13 inches long, 1¾ inches wide, made as per cut 4, with one hole drilled 6¼ inches from end and one 5¾ inches from that.



SEAT PIECE, 3A.

3b. Four (4) pieces the same as 3a, having the holes as per cut 5. These 8 pieces to be beveled on top edges.



SEAT PIECE, 3B.

4. Rods. Four rods of steel, with rivet heads to fit

9 inches long and 1-16 inch less in diameter than size of holes.

Construction.—After having the foregoing pieces made, take the 8 pieces 1, pass one of the rods through the holes nearest the end, *i.e.*, the one 10 inches from end. They should now look as one piece.

Rivet the ends of the rod, over countersunk rivet heads on each end.

Take 1st, 3d, 5th and 7th, open apart from others and place tongued ends of short side into the holes in one of pieces 2: 1st to go into hole nearest the end, 3, 5 and 7 in the others. Short ends of 2, 4, 6 and 8 to go into other piece 2, taking the hole at long end for 2.

Take the 4 seat pieces 3a, call these 1, 3, 5, 7, and place the four seat pieces 3B between them thus: 1, 3B, 3, 3B, 5, 3B, 7, 3B.

Running a rod through the centre hole and riveting, have side holes in 1, 3, 5, 7, to the right, others to left, bevel edges of all to be on top.

Place them in this position, between the long ends of side pieces, having hole in No. 1 to the right and in line with hole in side piece 2, run a rod through both and through seat pieces 3, then side 4, seat piece 5, side 6, seat piece 7 and side 8, and rivet. The others in the same way as position will show.

The top pieces 2a, with rounded side inside, mortise hole nearest end to go on 8, etc.; but here there is no need of detailing, as the chair in this condition will show, when properly placed.

The chair can be folded up, by placing the hand under centre of seat and raising upward. To prevent this happening when in use, drill a hole through 2 of the seat pieces, sidewise for a wooden or metal pin, which can be removed when not in use.

Glue on ends and use oil in finishing, this giving a more artistic finish than varnish. The expense of making should not be more than two dollars at the most, even should all of the wood-work have to be made by others.

THE VARIABLE ACTINISM OF SOLAR LIGHT.

BY G. A. SAWYER, U. S. N.

PROBABLY the scientific reader will at once object to the title of this article and say that solar light is invariable and that the apparent changes are due to atmospheric causes; however that may be, the phenomenon is well known, but it may be of interest to the photographic fraternity to call attention to certain phases of its manifestation with the hope that the busy worker may take into account some elements of uncertainty in making exposures, which it is thought are too often neglected.

All photographers recognize the enormous changes which occur as we approach or recede from the hour of high-noon, and this photographic ANNUAL, for instance, gives a table of comparative light values, and comparative exposures, showing the changes which take place from hour to hour, day by day, and month by month. It is, however, always assumed that the light on Monday noon is practically the same as that on the following Tuesday, and that the light on one July day differs in no appreciable quality from that of the succeeding July, but every practical worker knows that such is not the invariable fact: only when trouble occurs which might fairly be laid to this cause, it is usually laid to something else which may in fact be quite innocent. We never make progress when we ascribe our mistakes to the wrong cause: when, on the other hand, we once know what is wrong we are on the high road to the proper remedy, and it is to this point that it seems desirable to draw attention.

Besides the changes which occur from day to day there are others due to the variations in seasons which are quite inexplicable, but which are nevertheless interesting and worthy of note as exercising a potent influence upon the character and success of our work.

The subject is best illustrated by examples. To premise it may be proper to state that the experiments and observations from which my conclusions herein are drawn have all been conducted under exactly similar conditions year by

year in the same locality, in fact nearly all my photographic work is done during rather a long vacation at Lake George, N. Y. Here we have, as a rule, favorable conditions. In summer the air is pure and dry, rarely obscured by fogs. The days are apt to be bright and sunny, and except for an occasional autumn fire in the woods, which gives us some smoke, happily getting of rare occurrence of late years, nothing mars the delicious quality of nature's efforts at her best to make a happy hunting ground for appreciative mortals.

For snap-shot work I use a detective camera with a 6-inch Dallmeyer R. R. lens. Stop *f*/16 or larger with a slow shutter. For the whole season of '89 it was found almost impossible to get properly timed exposures and the aperture was enlarged to *f*/12 or *f*/10, with but little better effect. In August we had a visitor, one of the most skillful members of the New York Camera Club, and he was faithfully warned that the sun was off duty, and that it would be necessary to limit drop shutter work to a very narrow interval before or after noon on bright days. With the confidence begotten of hundreds, perhaps thousands, of successful exposures all over the world with rarely a failure in development, he made some 135 exposures and got, on his return home, less than two dozen thin negatives; and he generously wrote me, admitting that my advice was justified.

During the summer of '91 the Rev. Dr. B., a well-known and distinguished New York divine, as clever at photography as in bringing sinners to repentance, went out one day, and from the deck of a little yacht made twenty-four exposures and produced an equal number of exquisite negatives. The very next day, under conditions of light and atmosphere positively identical so far as our senses were capable of estimating, he exposed twenty-four plates and got an equal number of blank failures. He naturally laid the mishap to the plates, but the plates were not probably at fault at all—nor was the worker, but, to my mind, the evidence was clear that the light had gone off.

One other example. Last summer, the summer of '93, was a peculiarly brilliant one. Almost the first exposure made by me was on an open landscape, a corner of a hay-

field full of blooming wild flowers, at close range, with trees and shrubbery for a background. With a Carbutt Eclipse film, Dallmeyer R. R. 6½x8½ lens, stop *f*/40, an exposure of about a second gave an excessively overtimed negative. A temporary hard rubber diaphragm, perforated with an aperture of about *f*/70 with an exposure of a second or less still gave over-exposure. Under ordinary conditions my experience would have called for an exposure with *f*/40 of about two or two and a half seconds.

We had in our garden a bed of California poppy, the escholtzia, yellow and orange colors. They were only fully open and the light and shades right for about an hour or so, between 9 and 10 A.M. each morning. To get the color values I used an orange screen and orthochromatic film and the lens within five feet of the bed, with *f*/20. Four seconds exposure gave a correctly timed negative. Under the usual conditions of light for such a subject I do not think thirty seconds or more would have been excessive.

On subjects not including anything nearer than say one or two hundred yards, landscapes, mountains, water, etc., I found with *f*/20 and a color screen I could use a drop shutter and get correctly timed negatives developing in two or three minutes without forcing.

All my earlier experience with color screens had involved prolonged exposures, and while their use with a drop shutter may not be uncommon to others, I had not previously met with any conditions which suggested such a possibility.

From careful comparisons I feel convinced that for two or three months, in my particular locality at least, the actinic quality of the light last summer was fully from four to six times above anything within the range of my previous experiences, and I am equally convinced that at times I have found it from two to four times below normal. Of course I do not mean hazy days, or days when there was a yellow pall over the sun, but on days when no change was perceptible to our ordinary powers of comparison.

Should these suggestions turn out to be facts and not fancies, it behooves the prudent worker, whenever he can, to make a trial exposure and develop his plate on the spot, and

thus determine so far as possible the actual conditions of light under which his work is being done. For there is here an element of uncertainty which has not always been sufficiently taken into account.

WHEN IS A PHOTOGRAPHIC PRINT FIXED?

BY PROF. CHARLES EHRMANN.

THIS question so easily answered, although having been widely discussed in our journals and before the meetings of photographic societies, is nevertheless a source of vexation to many, and thousands of photographic prints go out in the world, of which a durability of six months cannot be predicted, because of their being incompletely fixed.

The word *fixing* does not at all express what is intended, for, the picture is indelibly fixed upon the paper when taken from the printing press, the function of the process of *fixing* being simply to remove from the paper all the silver haloid not acted upon by the light, and the derivatives of the process. The ground of such pictures should remain white for an indefinite period of time, for when all has been properly conducted, the picture consists of a metallic deposit on paper coated with gelatine or collodion, whichever the case may be. But pictures of that description are but of a very small minority, the great majority being improperly fixed. This is the case mainly with prints made upon our different aristo papers and toned and fixed in a so-called combined bath; in the first place because of the injudiciously compounded solution, and secondly, owing to the condition of the emulsion itself. Emulsion papers to be fixed in the combined bath should not react acid, or if so, the prints require a previous washing. The combined bath is in most instances acid, and often very much so, by which the evil complained of, sulphurization of the print, is very much aggravated.

The combined commercial baths mostly consist of hypo, alum, a salt of lead, and a trifle of gold. Through the mutual action of hypo and alum upon each other, sulphurous acid is evolved, and a great deal of it absorbed by the solution.

Sulphurous acid being an active reducing agent, throws down the gold in a metallic state, and might as well have been left out altogether, for all it is worth. The tone produced by such bath is a sulphur tone. The lead salt is added to accelerate the action of the bath, after which toning goes on rapidly, often to an uncontrollable extent. Gold, no matter how much of it may be present, does not enter at all into the action. The cuticle of gold precipitated upon a photographic print has always been considered a condition for its durability, and for that reason we find gold in various quantities combined with almost every one of these solutions. If but little lead is compounded with these combined baths, and every other condition is favorable, we will admit a precipitation of gold may take place, but when as much as 185 grains of it are found in 34 ounces of solution, there is hardly any possibility for the gold to act, till the desired tone has been attained by simple sulphurization. The sulphide of lead formed during the process is but very sparingly soluble in water, and in consequence of its great gravity is imbedded in the film and paper mass, where it remains. Exposed to light, prints toned that way fade and turn yellow.

Whether or not these commercial baths contain hypo enough to dissolve all the chloride of silver not exposed, and the double salts of hyposulphite of sodium and hyposulphite of silver formed during the process, is out of the question. How much hypo can there possibly be left in a 10-ounce bottle of solution, after 60 to 80 and more cabinet prints have been fixed in it? If nothing else will promote the toning properties of such baths, the dissolved chloride of silver will; gold is out of the question, and even the lead salt may be nearly or entirely exhausted. What results can be expected from such means?

But it is not only the fixing and toning of emulsion prints our attention is directed to, prints made on plain or mat surface silver paper demand an equal share of it.

Plain silver paper is capable of being toned to almost any color, between the brick red and the brown purple or positive black. There is much to be said in favor of mat surface silver prints; for example, their superior durability; but in regard

to toning and fixing these prints there are as many sins committed as with albumen, gelatine or collodion prints; hence do we find them of all possible or impossible colors, half faded after leaving the hypo bath, with whites just as impure as the most carelessly toned aristo print.

The paper for plain prints should be sized well. Gelatine produces a reddish color upon the untoned proof, starch a bluish black, but frankincense and mastic give probably the best tones.

Ammonio-nitrate of silver has invariably given good results on plain paper. If the print has to be of red color (a tone very much in vogue now among our more artistic amateurs), it is to be fixed in a pure hypo solution, 1 in 8; if a warmer tone is required, it is well to dissolve in the bath a little of chloride of silver, and a few grains of sel d'or (hyposulphite of gold and sodium). Positive black tones with pure whites are scarcely attainable with this method, and toning and fixing in separate solutions should be preferred, but the gold bath must be very much diluted, else toning proceeds too rapidly.

Whether fixed in plain hypo, or in the combined bath, or toned and fixed separately, the hypo must have full scope to act upon them, and be strong enough not only to dissolve in comparatively short time all unexposed chloride silver, but also the derivatives of the fixing process. If any particle of these double salts of hyposulphite of sodium and hyposulphite of silver remains in the paper, no washing in the world will remove them, and after a while will be seen in the form of streaks, spots or granules dispersed all over the paper.

Improperly fixed prints may be instrumental to destroy speedily the good reputation of a photographer.

Now let us throw a glance into the printing of a fine establishment, where from 40 to 80 sheets of paper are handled daily, but where unfixed prints are found almost to be the rule and not the exception.

It is half-past four or five in the afternoon, piles of prints have accumulated during the day, and as the day proceeds others are added, as fast as they are pulled off. While the

work preliminary to fixing is being done, the assistant printer reports, "There is no hypo solution." Fresh hypo is immediately made, of quantities of the salt and the solvent indiscriminately. "Hurry up," is the word, and so much or so little of the hypo is put in the tray containing water enough by guess-work. The hypo is not thoroughly dissolved, when the prints are immersed in the solution, moved about for ten or twelve minutes, looked at by transmitted light, when it is found they are but half fixed. "Hypo not strong enough," sounds the head printer, and stronger solution is added, but generally with the same results.

Our young friends omitted to consider one factor in the fixing process, *i. e.*, temperature. When hyposulphite of soda is being dissolved the temperature of it sinks to below freezing point.

Cold retards chemical action, heat accelerates; and no photographer should forget that.

That an ice-cold hypo bath cannot be as active as if of moderate temperature is an undeniable fact, and is very likely the cause of so many unfixed prints leaving photographic establishments. The hypo to be used in the evening should be dissolved in the morning, and be exposed to the temperature of the operating room. To make the solution by guessing quantities is inexcusable. So much hypo is required to dissolve so much chloride of silver; a vignetted print needs more of it than when the whole sheet has been exposed. Three times more hypo than is wanted must be present in the solution to dissolve the argentic sodium salt, not a stronger solution, but an abundance of it of the strength 1:8. Is that not observed, no washing in the world, no chemical hypo elimination, will save the print from perdition.

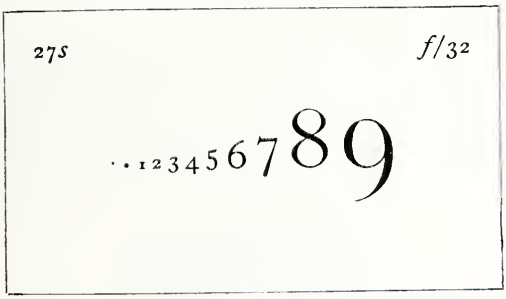
PHOTOMETER.

BY GRANVILLE W. WRIGHT.

I WILL try and explain a simple and quite an accurate photometer which certainly is convenient and inexpensive. To those who stick to one lens, one developing formula and one brand of plate, it will aid them very much in nearing the perfection point, but to those who are constantly changing from one brand of plate and formula to another it will be of no use.

I first focus the picture, then put in stop *f*/32 with head under focus cloth as near light tight as possible, *i.e.*, shut out all light except that coming through *f*/32 stop and ground glass.

Have a small white card with numbers arranged thus:



The first figure small, the next a little larger, and so on until large number is quite plain.

Holding this card at right angles with and a little way from ground glass under focus cloth try to read the numbers as you would a book or paper near a window. If I can read 2 and cannot read 1 I expose plate two seconds. If I can read 3 and not 2 I expose three seconds. Expose plate according to smallest figure that can be read.

Different cards should be made for different sensitometer and number of plates, and such number put on corner of card, as shown in cut.

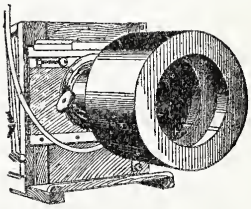
Always use same stop for reading that you wish to expose plate with, the gauge card to be graduated accordingly.

To obtain first gauge card you will get very near correct by selecting a developed negative which you consider about correct in density; place it in place of plate-holder inside and against ground glass of camera. With lens open to largest aperture in a light as near as you can remember you took the picture, head, card and pencil under hood, light tight, mark No. 2 just visible or 3 according to exposure you gave the picture; now move the camera into different lights, in shady, mild and sunny places, marking card just visible until all numbers from 1 to 9 or more are on card. After a few trials you will have the card so that you can gauge your exposure at any time of year. The best time to make the exposure card is during summer months.

AN IMPROVED LENS HOOD.

BY C. R. ARNOLD.

I HAVE found it so difficult to avoid reflections from the inner surface of the cone extension to hood that I had a hood similar to the accompanying engraving constructed, and found it so much better that I now have them on all my lenses, not only for field but studio work also.



For a 4 inch lens, a tin tube 6 inches long and 9 inches in diameter, with two diaphragms with 6 inch openings and a collar ¾ inches wide to fit on the brass hood—that is all.

At a glance you will see that the diaphragms preclude the possibility of any reflection from the inside of the hood, for although it be exposed to strong light, the side of the diaphragm next to the lens is in deep shadow I have had them made of light tin, varnished with asphalt on the outside and with a dead black inside.

FORMULÆ.

BY W. F. FENTON-JONES.

LET us for a moment reflect on our title, "Formulæ." This will take in almost every class of photographers, if not all. We cannot do without something of the kind. There is a rage for formulæ, and nearly every successful worker is immediately asked for his after his work has been approved in some way. Doubtless brains are necessary even to use *any* formula, but one likes to start with a good prescription, so that if any fault occurs he knows who is the artist to blame.

It is very well, too, for the old and experienced worker to say to the young one: "Stick to one developer," but there is some charm about trying everything, and if the old worker is "pumped" you will invariably find he has had a "go" at the various new things. Of course, if that were not so, how could he give his experience. Mark, though, he is right up to a point that we must of necessity get on better with what we are acquainted with, than some new thing. But if we are shown anything better than what we are using, why on earth should not a change be made? Where would all the advance be if we were to go along only in that same old jog trot way so much advocated. This is why so many professionals get left behind and cry out trade is bad. People are getting more enlightened every day, and know more about photography and want something new. New ideas, new colors. Everything new.

It may be urged that formulæ do not come in here, but, after all, it may be that a new formula will alter the whole character of a print or something necessary to its production. Perhaps we want a certain negative, black or yellow, a particular sort of print, warm or dark in color; well, then, your formula may be capable of producing it.

Of pyro formulæ (at the risk of being considered an egotist), I would advocate the following (10 per cent. solutions):

Wratten's formula (pyro-soda), which doubtless will be

found at the end of this book, or Paul Lange's, is as follows:

Washing soda	2 ounces
Bromide of ammonium	20 grains
Water	16 ounces

Take ½ ounce of above and make up to 2 ounces with water, and add pyro dry (about a grain or so) at time of use, less pyro, of course, for portraiture than for landscapes.

Mr. Lange works tentatively, which is, in the writer's opinion, the best way to go about it.

Hydroquinone is not to be recommended against pyro, owing to its tendency to produce harshness, but if one has to be used, by all means use the one given by Ilford Company, which is:

1.

Hydroquinone	160 grains
Brom. potassium	30 grains
Sulphite soda	2 ounces (avoir.)
Water to	20 ounces

2.

Hydrate soda	100 grains
Water to	20 ounces

For use, equal parts.

Amidol is another good developer, preferable, in my humble opinion, to metol, which produces an eruption on the fingers. Amidol is especially good for bromide work if used dry as follows:

Make up solution 1 ounce of sulphite soda in 20 ounces of water, and for use take 1 ounce of solution and add 1 ounce of water with about 4 or 5 grains of amidol; a bone spoon can be used to measure it with. If desired, negatives can be equally well worked with it, but it is then necessary to take the solution in strength without diluting at all.

So much for developers; now for combined toning and fixing bath. Much has been said about the permanency of prints and otherwise by such process, but I have some now done by it twelve months ago, which, though the test is not perhaps of long enough duration, are still the same as when

H. J. Ormsbee Eng. Co.

iss Elaine Terris.

PORTRAIT BY SARONY.

done; no signs of fading. They are toned with the following bath:

Distilled water	20	ounces
Hypo	4	ounces
Sulphocyanide of ammonium	3½	drachms
Acetate of lead	1½	drachms
Citric acid	1	drachm
Powdered alum	1	drachm
Chloride of gold	8	grains

A nice rich, warm color is obtained, so much a relief from the nasty cold-toned prints one sees so frequently. So much for some formulas which have been all successfully worked by the writer, and if they are of any value to any of your readers then my boldness in penning these lines has been rewarded.

INTERIOR PHOTOGRAPHY.

BY H. P. STARK.

INTERIOR photography has not kept pace with portrait photography because of the greater expense, difficulty of proper lighting, want of attention and interest on the part of expert photographers, and the apathy of the public.

Very few interiors are sufficiently lighted by day and the resort to artificial light is now in an infantile state, and therefore attended with more failures than success.

The smoke and dust of repeated efforts to obtain one good photo of an interior disgusts some people, who affirm they would not repeat the experiment.

Now, I have partially abated these difficulties in my business by making such pictures of home life, business places, interiors and views that people forget all about the annoyances.

I make my preparations to take a room so carefully as to avoid the necessity of repetition, which reduces the smoke and dust nuisance to a minimum. To do this I secured, after much tribulation, the best apparatus and then practiced at home all over my house until I could plant my camera in any room at any time of day or night and secure a perfect picture at the first trial. I have previously used a 10x12 lens of 100 deg. angle on an 8x10 camera, which gives more distinctness to the small objects than a smaller lens will do.

Now I am using my 10x12 lens on a 10x12 camera, which gives 50 per cent. more of the surface of the room and greatly adds to the interest of the picture.

This is the way to cure the apathy of the public and increase the demand for new business.

Longfellow said: "If you would teach a child love, beauty and truth you must surround it with love, beauty and truth," and so if we desire people to patronize interior photography we must surround them with beautiful and true demonstrations of the art. Sometimes I allow members of

a family to sit in a room taken, and have made some of the sweetest representations of family life, that cannot be obtained in any gallery because there the associations of home surroundings are wanting.

In a thousand American homes only a few are now destitute of photographic portraits, and only a few have first-class photographic interiors.

I believe that interior photography has a great and growing future.

FLOWER STUDIES FOR LANTERN SLIDES.

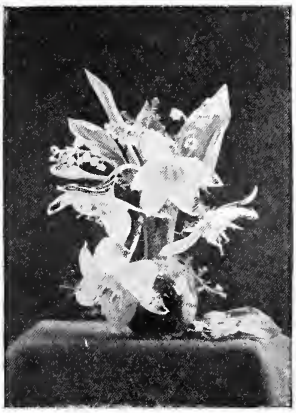
BY JOHN CARPENTER.

THE growing popularity of lantern slides is an inducement to make a few remarks thereon, some of which may prove instructive to the tyro if not to those more advanced in this most fascinating branch of the photographic art.

My special *forte* has, hitherto, been flower studies, which, from the first, "caught on," and from their very simplicity and naturalness seem to appeal to the general public in a remarkable manner. As an instance of this, at an exhibition of prize lantern slides which I attended a short time since, I noted that, although some charming landscapes and interiors, etc., were thrown upon the screen, many especially fine, none elicited so much applause as a picture of a group of primroses, entitled "Sweet Harbinger of Spring." This slide, by the way, was *not* one of my own.

As flowers abound almost everywhere, it is not at all diffi-

cult to procure good subjects for lantern slides; indeed one is sometimes at a loss to decide which will make the most pleasing studies. A little experience will, however, smooth the way, and as the interest increases, the task will become a delightful one.



It would be an easy matter to give a list of suitable flowers for our purpose, but a great deal more will be learned by making some trials and noting the effect upon the ground-glass of the camera. A few general remarks, however, as to the best method of working, may prove acceptable.

Two most important points to be observed in making flower slides for the lantern are the arrangement and the lighting of the subject. As regards the former, some very satisfactory groups may be made with vases of various shapes and characters. I may say here that the lines of the vase used, if chosen with judgment and taste, add most materially to the *tout ensemble* and pleasing effect of the picture. Of course highly ornamented vases should be avoided, also very dark-colored ones, and

even when they are of a light tint the shadows thrown from the flowers may make them appear darker than is pleasing. Jars of a cream-colored material and plain or opalescent glass are the most useful, and always photograph well.

The grouping now claims our attention. It would appear a very easy matter to arrange a pretty group of flowers, and so undoubtedly it is, but to set up a group which will please and prove satisfactory when photographed is another matter. I have often been annoyed by the pertinacity with which some flowers refused to compose as one wished them, the whole arrangement looking stiff and formal. Some flowers, on the other hand, seem to fall into the most harmonious lines of their own free will, and at once become things of beauty. One of the most graceful groups may be made with the lovely tea roses of the habit of Maréchal Neil or Niphetos, their drooping flowers and handsome pale green foliage rendering them particularly well suited for our purpose. A vase with curved outline will suggest itself as the best for this subject. Again the charming Spring flowers of the Narcissus type, with their delicate gradations of golden yellow to white, lend themselves admirably to grouping, although their grace is of a different stamp; the upright flowers and grass-like leaves are best set off in a tall, slender jar, which may in the photograph be reduced to about one-third of its height with advantage. The sprays of fruit blossoms (apple, pear, cherry, etc.) are capital subjects. A branch may be taken as growing, or placed in a vase, but an artistic turn of mind will suggest an endless variety of subjects and beautiful arrangements.

The lighting of the subject demands as much consideration as in portraiture, and anyone possessing a studio will

have a great advantage over others who must work out of doors. I may say that any glass-house, green-house or conservatory, is well adapted for the work in hand, as the top light can be modified with temporary blinds or shades as may be found necessary.

A good light from one side will give the most pleasing results, and the background should be of some dark or even black material, and be well protected from any strong light.* It is well to endeavor to get a clear glass background to the negative; the effect on the screen is thereby rendered quite stereoscopic.

There seems to be a growing taste for warm tones in lantern slides. Many subjects are well adapted to these colors and flowers specially so. Warm tints are readily obtainable with nearly all brands of lantern plates. In my own practice I use pyro-ammonia; the following is a good formula:

A.—Pyro	40	grains
Metabisulphite of potash	120	grains
Bromide of ammonium	40	grains
Water	20	ounces
B.—Ammonia (880)	2½	drachms
Water	20	ounces

Give a full exposure, and use equal parts of A and B, adding 5 minims of a one in ten solution of carbonate of ammonia to each ounce of developer; or the following may be used, giving a very full exposure:

HYDROKINONE.

No. 1 Solution.

Hydrokinone	160 grains	or	15 grammes
Sodium sulphite	2 ounces	or	100 grammes
Citric acid	60 grains	or	5 grammes
Potassium bromide	40 grains	or	4 grammes
Water	to 20 ounces	to	1 litre

* A very dark ground throws out the flowers in strong relief.

No. 2.

Sodium hydrate	160 grains or	15 grammes
Water	to 20 ounces to	1 litre

No. 3.

Bromide ammonium	2 ounces or	90 grammes
Water	20 ounces to	1 litre

No. 4.

Carb. ammonium	2 ounces or	20 grammes
Water	to 20 ounces to	1 litre

No. 1	½ ounce
No. 2	½ ounce
No. 3	15 minims
No. 4	15 minims
Water	to 2 ounces

A great variety of tone may be obtained by modification of the exposure and developer. Gray and black tones are more easily obtained, but to many are not so pleasing. The following is a good formula for gray tones :

Eikonogen	¼ ounce
Sulphite of soda	1 ounce
Bromide potassium	6 grains
Carbonate potash	¼ ounce
Boiling water	10 ounces

This may be used repeatedly until exhausted, and will be found an economical developer.

Lantern plates are now made of such quality that an inferior brand would not stand a chance of holding its own. Personally I prefer a slow plate as I make most of my slides by contact, and with these the chances of failure are reduced. An acid fixing bath will do away with clearing, and is made as follows :

Hypo	4 ounces
Metabisulphite of soda	1 ounce
Water	1 pint

This bath will keep clear for a long time. After fixing, a good washing in the rack, and lastly a rinse under the tap, using a tuft of cotton wool to remove any deposit in the water.

I should mention that isochromatic plates are indispensable for colored flowers and I invariably use them, as ordin-

ary plates would not give the proper values; yellows and greens which are predominating colors, being rendered much too dark.

It will often be found when making negatives on quarter plates, that the subject is too large for a lantern slide without reduction in the camera; to avoid this it is well to make the picture fit a certain mask before it is photographed.

I have a series of masks, and, according to the subject, place one on the ground glass, so as to include the group within proper limits for the mask in use. This saves a deal of useless worry in fitting a mask to the finished slide, and will well repay the extra trouble.

To conclude, still life is always an acceptable change from land and seascapes, and if any readers of THE ANNUAL are desirous of taking up one of the most interesting branches of photography, I can confidently recommend them to make flower studies.

A COMPOUND STEREO FRAME AND SHUTTER.

BY OTTOMAR JARECKI.

THE next thing after getting a pair of stereo lenses is the question of the shutter or exposer. The flap shutter will answer for time exposures, but for instantaneous work something else is required. The ambitious but impecunious amateur will turn sadly from the shutter priee lists, and will seek advice among photo literature. There he can find, and, like the writer, will try various plausible, single and double slide, diaphragmatic and rubber band devices, which turn out to be unmechanical, and have to be put on the shelf.

Now the purpose of this article is to describe an arrangement of parts, compact, reliable, durable, and simple withal, which has worked well for the several seasons it has been in

Photo by C. R. Pancoast. The Electro-Light Eng. Co.

INTERIOR OF AN INDIAN MOSQUE.

use, and has seemed to impress favorably chance amateurs who have come upon it in the field.

It consists, in brief, of a self-contained lens board, twin stop-slides, time and instantaneous shutter, and is used with single lenses; two pairs of cells carry respectively five and six inch focus lenses at present, with a pair of longer focus in prospect. The six inch focus lenses are the ordinary commercial ones usually supplied with stereo apparatus, and the 5-inch lenses are taken out of a pair of opera glasses, cheap but achromatic and very good, and with the exception of the cells of these latter, which were left intact, the whole apparatus is home-made, and can be so made without much difficulty. While on the subject of lenses it might be of

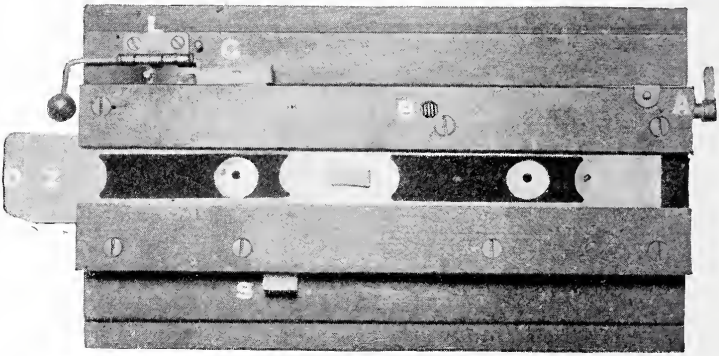


Fig. 1.

service to call attention to the one-ninth size "Gem lenses" often found in bargain lists, where they can be often had for one dollar each, or less, in matched pairs or grouped by fours and nines. The front lenses of these are very excellent for landscape work. In the older makes they range from six to six and a-half inch focus, and in newer ones up to nearly eight inch focus. Of course, they must be matched for stereo work, and if the complete lenses are found to be matched, the front lenses are apt to be also. Opera glasses can now be had as low as three dollars with lenses suitable for this work, while catalogues also list unmounted lenses, so that a battery of lenses will require no considerable outlay.

Of the illustrations accompanying this paper, Fig 1 is a half-size representation of the shutter and lens front, as it looks when set for focusing or for time exposure. The letters affixed refer to the same parts also in the other illustrations, which are a little smaller and not to any fixed scale. The distance between the lenses is three and one-quarter inches. The shutter opening is fully four times as long as the diameter of the largest stop, thus giving a high "coefficient," that is, utilizing more light for the same exposure than a shorter opening, not to say a round hole, would.

The stop shown is $f/45$, with the opera-glass lens, increasing in the U. S. order to $f/11$. When the longer focus lenses are in place, naturally using the same stops, the time required is about one-third more for each stop, thus $f/11$ becomes $f/13$, approximately, and so on. At *b* the coils of a brass spiral spring are shown, about No. 30 wire, reaching from this place to the adjuster *a*, when the shutter has been discharged and the spring is then without tension. It has a hook at *b*, which goes into a hole in the shutter slide. As this spring is stretched out about two inches when the shutter is set, it must be light, undue friction being avoided in the working parts. At *a* the spring is inside of a brass tube an inch or more long. The tube is notched, and, when pulled out for increased tension, is held by a flat spring, shown, acting on the notches, ratchet-like. Back of the shutter slide is felt, but between the slide and the wood are two small pieces of watch-spring, opposite each lens opening. If replaced by felt, the shutter would bind in damp weather. To set or close the shutter the slide is moved to the left, placing the finger on the small catch for this purpose between the openings; the detent of the locking device will come to the right of the catch. Both the time and instantaneous catches are shown plainly in Fig. 3. The shutter is now set for time or instantaneous exposure, as the fancy may strike the operator when he comes to make the exposure. There is absolutely only one way of setting the shutter for the two uses; it is always ready for either. The

Fig. 2.

stop plate moves with a click which can be felt like a rotary lens stop, and, besides, is stopped at the end of its travel each way by solid wood; it can easily be shifted by the sense of touch, and if, for instance, it was determined in the first place to make a time exposure, and the light should suddenly brighten, the plate can be shifted to a larger stop and an instantaneous exposure can be taken. The difference in manipulation is only this: For a time exposure the button is slowly depressed—a very safe proceeding—and the slide will jump to the position of Fig. 1, when a second depression will carry it the rest of the way. There is no danger of jar, as I have frequently made exposures of one second, perfectly sharp, which would not have been the case if the opening of the shutter had started any vibration. For an instantaneous exposure the button is simply raised to the position shown in Fig. 2, where it is propped up for the occasion, as it falls by its own weight in practice. The position of the button is so planned that the hand need not be carried in front of the camera to operate it. The shutter moving at the place of the diaphragm, and in absence of a lens hood, the angle embraced is deceivingly wide, and in the earlier forms of release has often included portions of the writer's personality on the plate.

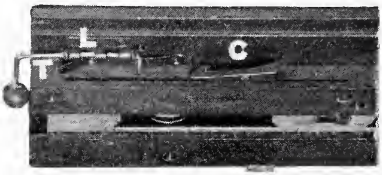


Fig. 3. S

In Fig. 2 we have an end view. At *f* is shown the safety edge of felt referred to in a former Annual. On the front of the lens board are the rabbeted wooden strips, bedded on felt, carrying the slides. These, as well as the lens board, are of cherry. The three bright lines indicate, respectively, the stop plate, the partition, and the shutter slide; between them is also felt, securing light-tight, easy moving joints. These slides are of zinc; they would be better of brass, but zinc can be more easily obtained sufficiently flat. At *s* is shown a side view of the stop shifter, which is in one piece with the stop plate, while *m* is the lens mount, containing opera-glass lens in its original cell.

By H. Troth.

The Moss Engraving Co., N. Y.

ON LEWES CREEK.

Fig. 3 is a top view, and tilted to give a better idea of the locking and release mechanism. It also shows the slot in which the projection of the shutter slide works, which carries the double catch *c*. On taking the shutter apart, the slide is passed through this slot. I am not sure, but that most experimenters would rather invent a new device than follow out the description of this one. However, this works very smoothly, and is perfectly reliable. The shape of the tripping spring will easily be made out. It lies loosely on two dress pins for pegs, the holes being an easy fit. When the shutter slide is moved to the left in setting, the first catch depresses the right-angled detent terminating in the button, and this in turn depresses the tripping spring. When the catch has passed over and beyond this, and the slide is let go, it leaves the shutter open, as in Fig. 1. Call this first catch the time (*t*) catch and the other one the instantaneous (*i*) catch. If now the slide is carried further to the left, this catch depresses the turned-up end of the tripping spring at *t*, and so raises the other end of the spring and with it the detent. By this time the *i* catch has passed the detent, and, the spring having lifted this detent up, it now holds the *i* catch securely. All this manœuvring is necessary, because the *t* catch must be appreciably longer than the other, else it would fail to hold the shutter open for time exposure, and the tripping spring makes allowance for the shorter *i* catch by raising up the detent to meet it. Founded on this principle, devices can be multiplied to accomplish the same end.

The shutter is set by one motion of the finger, the locking mechanism working automatically.

Following the generous example of Mr. Metcalf, who made a similar offer in THE ANNUAL a few years ago, I will send on request to any earnest inquirer a stereograph, architectural or landscape, showing the capabilities of such lenses as above described.

ON THE INFLUENCE OF ART ON PHOTOGRAPHY.

A REVIEW BY PROF. KARL KLAUSER.

MANY attempts have been made to raise the more or less mechanical productions of photography to a higher and more artistic standard, especially since the advent of the amateur and the quick dry plates. But even in the times of the old collodion process there were photographers with artistic instincts and education who did very much to improve on the then common black and white style of portraiture. Ingenious modes of lighting were invented, a better rendering of half-tones and thereby a better modeling of the subject were secured. Some of the more ambitious photographers went even a step further by attempting "genre" compositions—peasant girls waiting at the garden stile, children at play, etc. Some excellent work of this description was made by our best known photographers: Kurtz, Sarony, Reijlander, Rocher, Ryder, and many others. The chief difficulty in those times was the slowness of the process, necessitating long exposures. This difficulty has been greatly obviated by the introduction of the quick dry plate of modern times, by which the photographer can get good results by very short and even instantaneous exposures.

The works on artistic picture-making by photography, by writers like Burnett, Robinson, etc., stimulated the artistically inclined photographers to study more closely the art-side of their profession. The advent of the "amateur," very often of a very cultured class, having some artists of repute among them, also helped to raise the hitherto mere mechanical profession to a higher level.

The prize offers for illustrating poetical works like "Evangeline," "Hiawatha," etc. (though ill chosen, in my opinion, because requiring a too elaborated composition, especial backgrounds, intelligent and ideal models, etc.) also helped photography in the art-direction, though none of the results proved to be entirely satisfactory. The intelligent amateur with his accustomed daring gave us some interesting lessons in plain-air photography, especially in portraiture,

showing artistic results, superior to the ordinary overdone retouching methods of the "professional." It is also interesting to notice the intelligent success of lady photographers in the endeavor to create artistic photographic pictures, outside of the common amateur's line. Various novel ways of printing, as, for instance, the one on aristotype mat-surface paper, on bromide paper, the platinotype, etc., greatly assisted in giving results of a higher order in artistic photography.

I have before me a selection of twelve photographic studies,* illustrating the immense advance in artistic photography within the last ten years. This selection ought to be in the possession of every ambitious photographer—professional and amateur—as showing and hinting at the art-possibilities of photography. All the landscape and portrait studies are excellent, while among the attempted "genre" pictures I am inclined to give the place of superiority to John E. Dumont's solitary figure named "Solid Comfort"

LANTERN SLIDE MOUNTING.

BY D. W. CARTER.

THERE have been many schemes and devices for mounting lantern slides, but until I had hit upon the following plan I found none that gave the desired result.

Being a fastidious sort of a fellow, I liked to see the slides matted and bound squarely and evenly. I succeeded in getting my mats cut to please by using the ordinary brass form with a little modification.

The above plan will help to make my meaning clear.

Take a piece of ½ inch pine board about 6 x 8 inches and mount upon it, by means of grooved pieces of thin wood, a piece of glass 5 x 7 inches.

* "Twelve Photographic Studies," sold by The Scovill & Adams Co.

On the lower edge of the board nail a thin strip that will be a trifle wider than the thickness of the board and glass together, to allow it to extend above the surface of the glass and make a wall to work against.

Place the glass upon the board against this wall, and nail the grooved strips around the other three edges. This will hold the glass firmly and protect its breaking.

Now that we have a cutting board, procure of a stationer a few sheets of paper which is black on one side and white on the other, and have it cut to the regular size, 3¼ x 4. A few cents' worth will make five hundred. Then take a brass form, which shall be as much wider than the desired opening as the width of the lower margin of the mat, and place upon it at equal distance from each side. This will allow the placing of the edge of the mat to be cut and the form against the wall, thereby always getting the opening square to the edges of the mat.

I use a rotary cutter to run around the edges of the form, but many prefer the sharp point of a knife.

Thus three sides of the opening will be cut, and by turning the mat half way round, so as to bring the top to the base or wall, as I have called it, the remaining side can be cut in the same manner as before, thereby giving an equal border on all sides, and, consequently, a properly centred picture.

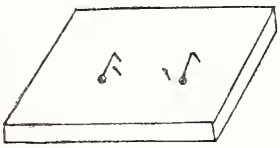
With the mat properly cut, and both slide and cover absolutely clean, the next is to fasten them firmly together.

I use the binding which comes in rolls, and cut it by means of a block of wood which is ⅞ of an inch thick, 2¼ inches wide, and 3½ inches long, with a crease around the centre of the edges.

If the binding is wound around the narrow way of this block and cut with a knife where the creases are on each side, it will give strips 3⅛ inches long for the ends of the slide. By winding the block the other way the strips will be 4⅜ inches long, which will allow trimming after they are stuck to the sides.

My greatest difficulty has been to get the binding on the slides so as to have an equal margin on each side. I overcame this in the following way:

Take two wire nails which are bent to a right angle and drive them into a small board until the upper part or heads of the nails will nearly touch the top of the board. This allows room to put the gummed binding under them. Drive two brads ⅛ of an inch back of the heads of the nails. Place the binding under the heads of the nails as far back as the brads will allow, and put the edge of the slide to be bound next the heads of the nails, then press it down on to the binding and turn over in the usual way; thus always getting an even amount of binding upon each side of the slide.



I have mounted slides in this way for a long time and find it works very satisfactorily. It will always give a properly centred slide, neatly bound, which is a pleasure to the operator of a lantern as well as an audience.

I have thrown several hundred slides of the Exchange upon the screen, with half as many different centres, which is not only provoking to the operator but very unpleasant to the audience.

ABOUT INSTANTANÉS.

BY P. C. DUCHOCHOIS.

IN instantaneous photography the exposure time is entirely subordinate to the speed of the moving object and its distance from the lens, or, which is the same thing, to the size of the picture. If the motion is slow and does not require an exposure of less that $\frac{1}{50}$ or $\frac{1}{60}$ of a second, the latent image, in good conditions of light, will be sufficiently impressed to yield a negative full of detail by using a lens working at $f/8$, stopped down with a large diaphragm to $f/14$ or $f/16$. But if the exposure should be very rapid, from $\frac{1}{100}$ to $\frac{1}{200}$ of a second and even less, then lenses working with a greater intensity should be employed.

The extra rapid rectilinear lens, made of Jena glass, working at $f/5{\cdot}6$, that is, *twice more* rapidly than the ordinary rapid rectilinear, will render excellent service when the exposure reaches $\frac{1}{150}$ of a second, but for extremely rapid

speeds the latent image would not be impressed enough to give sufficient details in the shadows. I use in these cases a 6½ inch back focus portrait lens working at $f/2{\cdot}75$, provided with diaphragms which we have thus graduated $f/4$, $f/6$, $f/8$, $f/10$. This lens works *eight times* more rapidly than the rectilinear of $f/8$ intensity. I use it in all circumstances, and with it I succeed whenever the quality of the light and the shortness of the exposure or the contrasts in the landscape present difficulties which one could not overcome with other lenses I even obtain, in the shade by a clear sky, instantanés at slow or medium speed with this lens in using the diaphragm $f/4$. The drawback of such lenses is their weight, which is considerable, but *qui veut la fin, veut les moyens.*

To give an idea of some of the exposure times (circle of confusion $\frac{1}{100}$) I append the following table:

MOTION OF OBJECT.	SIZE OF PICTURE.	EXPOSURE-TIME.	DISTANCE WITH A 6-IN. FOCUS LENS.*
1 mile per hour.....	$\frac{1}{40}$	$\frac{1}{50}$	20½ feet
" "	$\frac{1}{60}$	$\frac{1}{30}$	30½ "
" "	$\frac{1}{80}$	$\frac{1}{20}$	45½ "
2½ miles per hour (1).	$\frac{1}{40}$	$\frac{1}{150}$	20½ "
" "	$\frac{1}{60}$	$\frac{1}{80}$	30½ "
" "	$\frac{1}{150}$	$\frac{1}{30}$	75½ "
3¾ miles per hour (2).	$\frac{1}{60}$	$\frac{1}{110}$	30½ "
" "	$\frac{1}{80}$	$\frac{1}{70}$	45½ "
" "	$\frac{1}{150}$	$\frac{1}{40}$	75½ "
10 miles per hour (3)..	$\frac{1}{70}$	$\frac{1}{250}$	35½ "
" "	$\frac{1}{100}$	$\frac{1}{180}$	50½ "
" "	$\frac{1}{250}$	$\frac{1}{70}$	125½ "
18½ miles per hour (4)	$\frac{1}{50}$	$\frac{1}{640}$	25½ "
" "	$\frac{1}{70}$	$\frac{1}{450}$	35½ "
" "	$\frac{1}{120}$	$\frac{1}{270}$	60½ "
" "	$\frac{1}{250}$	$\frac{1}{120}$	125½ "

(1) Ordinary speed of a man walking. (2) Speed of a pacer. (3) Speed of a trotter. (4) Speed of a galloper.

For very high speeds (horse races, etc.) the exposure times vary from $\frac{1}{500}$ to $\frac{1}{1000}$ of a second, according to the

* The distance varies with the focus of the lens and in the same ratio.

distance of the object from the camera and the rapidity of motion of the same.

Observe that for instantanés the largest possible diaphragm should always be employed; the camera image is never too luminous.

The shutter I recommend is Thornton-Pickard's "Focal plane shutter," with adjustable slit and a speed indicator. Its range of speed is from $\frac{1}{20}$ to $\frac{1}{1000}$ of a second.

The great difficulty in obtaining good pictures when exposing at high speed is the development, for the exposure is always short and, the latent image being therefore feebly impressed, the question is to bring out the details in the shadows, which, in cases of extremely rapid exposures, are generally more or less wanting, no matter how skillfully the development has been done.

Two methods of developing are recommended.

Some authors admit that the greater the energy of the developing solution to act on instantaneously impressed films, the more rapid and *uniform* will be the intensification of all the parts of the image. My experience does not agree with theirs. I found that by this method of procedure in the development the intensity in the high lights increased out of proportion more rapidly than that of the details, and this so much the more as the exposure was shorter. Therefore, I do not advise this method, and recommend the gradual development with a developer possessing a feeble or medium reductive power. This is the second method. By it details are obtained which otherwise could not be brought out.

I always develop with pyrogallol. For the purpose now in question a small dose is employed, in order that when the high lights have appeared—and of course they always appear first—they do not find in the developing solution a reducing power strong enough to intensify them rapidly, thus allowing the details to develop and keep pace with the slow and gradual intensification of the lights.

Whatever be the exposure, short or long, I always commence development in this manner, then alter it according to the appearance of the growing image.

Here is an empirical formula:

Sodium sulphite, *granulated*	10 grains
Pure sodium carbonate, *granulated*	10 grains
Potassium bromide, 10 per cent. solution	2 minims
Pyrogallol	1 grain
Water, according to the exposure	1 to 3 ounces

When the solution becomes much colored, it, having partly lost its reductive power, should be replaced by a new one, in order to activate the development and avoid yellow fog.

The development is generally pretty long, and a good dose of patience should be added to the compound in order to succeed.

A NEW PRINCIPLE IN TRIPODS.

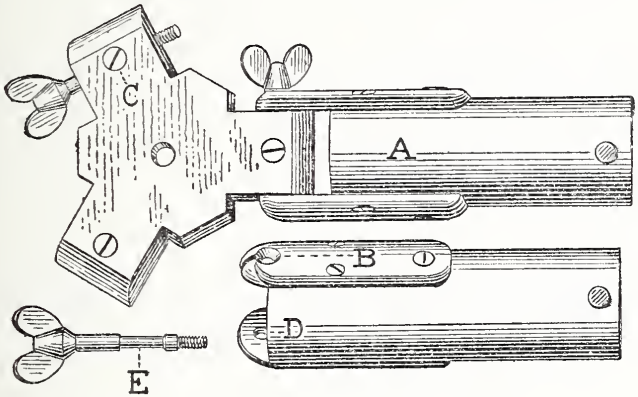
BY WILLIAM ROLLINS.

WHILE standing at the edge of a pond waiting for favorable winds and skies I have often noticed how beautifully some of the reeds growing in the water were constructed—a thin round tube of dense material filled with a very light pith—and determined to imitate their structure in a tripod when aluminum became cheap. This happened some months ago, and I have tested the tripod and found it good.

It is made in this way: Take thin tubes of aluminum of suitable lengths, cut off one end of three of these at an acute angle and solder a plate of aluminum on to this end, so as to make a point to hold the tripod from slipping on the ground. Next select the best cylindrical bottle corks a little larger in diameter than the tubes, and after compressing strongly, drive them one at a time into the tubes until they are full.

All that now remains to be done is to employ some method of attaching the legs to the top, in which there are no loose screws, which is rigid, cannot be accidentally unlocked, and yet will admit of rapid attachment and detachment. Such a locking device was invented by my friend Dr. W. B. Parker fifteen years ago, and though I have used it ever since this time and shown it to many photographers, it has never been put upon the market by any maker of

apparatus, though it remains the only method which meets the conditions. Referring to the figure—A shows a leg attached, B shows the conical bearing, which is filled by a similar-shaped piece of steel at the head of each screw,



D shows the threaded hole into which fits the end of the screw, E shows a groove in the screw, C shows the head of a screw which holds the screws from being detached and yet allows them to be revolved to attach and detach the legs.

MOUNTING OF LANTERN SLIDES.

BY A. S. MURRAY.

I HAVE access to the various contributions of slides to the *American Lantern Slide Interchange*, and I have noticed that there are not any slides mounted that I can discover by such examination, just as I am in the habit of doing and have so done since 1882.

My mode of operation is convenient and rapid, and is neat-looking and strong. The slide will work nicely in the lantern carriers, and not become torn or mutilated while sliding in and out of the usual "compartment" slide boxes.

Order from a bookbinder or printer—one who may have a large power-cutting knife—a required amount of Denison's

gummed label paper, cut into strips, an equal amount of each, 3¼ x ⅜ inches and 4 x ⅜ inches. After experiments with the different colors and textures of this paper I have finally settled on that known in Denison's list as "Tea Allsrope."

Have made a pad of canton flannel, or some other soft fabric, of about 4 thicknesses and 5 inches long, 1½ wide.

Have your mats fastened to the slide by a little gum on the corners, clean your cover glasses with manilla tissue paper, lay them in a heap, alternating a slide and cover.

Lay one of the gummed strips on the pad and pass over the gummed surface a small wet sponge. Pick up a slide with its cover-glass and place the edges in the centre of the moistened strip; it can now be lifted from the pad and pressed smoothly down. Start with the 3¼ edges and finish all these before you finish the 4 inch slides. I have mounted in the described manner, neatly and rapidly, about 100 slides in an evening, including the labeling and thumb marking.

PHOTOGRAPHING A COMET.

BY JOHN E. LEWIS.

IN the year 1881, at the Cape of Good Hope, when the great comet of that year appeared in sight, it occurred to Dr. Gill, the Director of the Observatory there, that it might be possible to make a photograph of it. With the assistance of Dr. Elkin, now in charge of Yale Observatory, and of a local photographer, a small camera was attached to the observing telescope and pointed at the wonderful stranger. After a short exposure the plate was developed, and, much to their surprise and delight, the comet with its tail showed upon the plate. This, so far as known, is the first time that a photograph of a comet was ever attempted. This plate, moreover, not only showed the comet, but also the stars around it, and from this came the suggestion that the entire sky might be photographed, and, as a result, all the splendid work in this direction has since followed.

Since the large comet mentioned, there have been none of great size, almost all those which have appeared being

telescopic ones. However, a photograph of a comet, although a small one, is usually very interesting. In order to make such a photograph, it will be necessary to have a telescope mounted equatorially. The camera with which the picture is taken, and which should be of large aperture as compared with the focus, is attached to the tube of the telescope, and then, by means of clockwork corrected by hand, the telescope and camera must be kept in motion to correspond with the motion of the comet. The head of the comet is brought into the field of the telescope under the intersection of two cross wires, and during the exposure is kept constantly in the same position. If the exposure be kept up for some little time, on developing, the plate will have a very curious appearance. The comet, of course, should be there, either as it appears through the telescope, or, as usual, with very much more detail, but the stars, instead of being points, are drawn out into straight lines. The length and direction of these lines will give accurately the rate and direction of the comet's motion.

From a photograph made at Yale Observatory on May 7, 1894, of the Gale Comet, after an exposure of one hundred minutes, these star trails were one-eighth of an inch in length, showing that the comet was moving quite rapidly.

It is well known that the camera reveals many things that the unaided eye, or eye when assisted by a telescope, fails to see, as, for instance, many faint stars, which would be, without a camera, forever invisible to the human eye. The camera does the same thing very often in the case of a comet; it brings out detail that the telescope cannot see. In the case of the Gale Comet, although it appeared simply as a bright round spot in the telescope, yet photographs were made at Yale Observatory, at Lick Observatory, and other places, showing a tail varying from four to six degrees in length. Moreover, even when the tail is visible to the eye, the camera will sometimes show that it is much longer than it appears to the eye, and that its structure is quite complicated. Some photographs made by Professor Barnard at Lick Observatory, during 1892, of the Swift Comet of that year, show that the tail of that comet was a very wonderful

structure. One of these photographs shows at least twelve tails, instead of the single one revealed to the eye, and the appearance of the tail changed from day to day. Two photographs of the comet taken forty-eight hours apart show very great difference in structure.

Astronomers are longing for the appearance of another bright comet in order to use their new weapons—the camera and the spectroscope—upon it. We shall undoubtedly learn from the next bright comet many things about the general nature of these wonderful bodies that we do not know now, and the camera will do its full share in this direction.

SOME SCIENTIFIC APPLICATIONS OF PHOTOGRAPHY.

BY ALBERT GLEAVES, LT. U. S. NAVY.

IN the year 1839, Daguerre astonished and interested the world by the results of his experiments in making pictures by sunlight on the metallic plates. This was the birth of photography as an art. In its undeveloped form it remained for some years incapable of being applied to portraiture on account of the great length of time required for exposure, but when that difficulty was overcome the development of photography began; a development that has been so brilliantly marked in the last two decades and which is still going on. Every year brings reports of the advance of photography in the scientific world, which proves its higher meaning, for the usefulness of photography is in its least degree in the studio.

Photography cannot be regarded as a discoverer, like electricity for instance, because as a rule we don't capture on a plate anything that cannot be made visible to the eye by this means, but its principal claim to distinction is as a labor saver. A notable exception to this, however, and worthy of mention, is the air disturbance photographed with flying bullets. It was from the appearances, and a subsequent experiment of an entirely different nature, at Newport, with gun cotton, that the theory, which is probably a fact,

was advanced that a projectile in penetrating an armor plate does not come in contact with the plate at all, but that the hole for the passage of the shot is made by an envelope of air that surrounds the shot and travels with it.

In the early days of researches with the solar spectrum, maps of the spectrum were made by hand, a laborious operation and one requiring exceptional skill. Mr. Rutherford of New York, who had already achieved distinction in astronomical photography, succeeded in making very interesting photographs of the solar spectrum. Mr. Rutherford's pictures were made many years ago, and of course with wet plates. The photographic instruments used in observatories at the present day are extremely complicated and of the finest workmanship. The adjustments are so delicate and so elaborate that only expert observers may use them, and, even then, satisfactory results are more or less problematical. Only the blue end of the spectrum is capable of producing a photographic image, hence investigations are limited to those portions of the spectrum that contain the blue rays. The spectrum is photographed on a small plate (usually the commercial rapid plate), the exposure requiring about one hour, and at the same time a comparison photograph is made of the spectrum of some substance that contains the hydrogen line or some other line known to be in the spectrum of the star that is to be photographed. The displacement of the comparison line in the stellar spectrum shows at once the direction of the star's motion; if the displacement be toward the red end of the spectrum, the star is approaching the earth, if toward the blue end, it is receding, and its rate of approach or recession is readily calculated from the known wave-length of the comparison line and the velocity of light.

Now-a-days it is not a difficult matter to photograph the sun and moon. The camera has brought the moon down from the skies, so to speak, and hung it in shop windows where we may at our leisure gaze upon its mountains and craters and marvel at the beauty and majesty of its rugged scenery.

In observations for the transit of Venus in 1874 and 1878 photography was used to fix the position of Venus on the face

of the sun as often as possible during the four hours of transit. This was accomplished by means of an apparatus that included a telescope nearly forty feet long. Of course such a long instrument could not conveniently be kept pointed at the sun, so it was fixed horizontally, and the sun's rays reflected into it by a polished reflector, so adjusted as to turn with the sun or rather with the earth. Although the mirror reflected only one-twentieth of the sun's rays, the intensity was such that an exposure of only one-tenth of a second was required. The plate-holder was mounted on a pedestal directly in front of the object glass of the telescope, and had placed in front of it a clear glass plate accurately divided into small squares by very fine lines about one-eighth of an inch apart. These lines were photographed on every picture taken of the sun; the central line was used as a meridian mark for the transit. Wet plates were used and are said to have given finer results than have been obtained in subsequent astronomical photography with dry plates.

Photography is used to register the magnetic disturbances of the earth. It is made to do so by suitably arranged reflecting mirrors attached to the freely suspended needles used for determining the amount of the three forces of the earth's magnetism. A ray of light from a lamp is reflected from the mirror and passes through two lenses, one of them hemispherical. The beam is thus converted into a point of light, which impinges on a revolving cylinder covered with bromide paper where it is photographed. It is evident that every motion of the needle, and therefore of the mirror, will be thus recorded on the paper. The photographs when developed show a jagged line, which, during an aurora or other magnetic storm, presents the most curious and interesting fluctuations, all of which have a positive value that may be easily calculated for any given instant of time.

At the World's Fair last summer a photographic map of the Rocky Mountains Park of Canada was exhibited. Nothing could show in a more striking manner the wonderful advance of photography as a labor saver. The map was made up of 12 sheets, each covering about 63 square miles. Each sheet was made from six stations inside and eleven outside;

1,075 points, or about seventeen points per square mile were fixed by intersection or by construction equivalent in accuracy. The average cost was about $7.42 per square mile, or about $5,600 for the whole map. A photographic surveying party usually consists of four men and an average season's work is about 500 square miles.

Photographic surveys are based on the fact that a photograph taken with a suitable lens is a true perspective in which the focal length is the distance line. By drawing the horizon and principal lines, all the measurements that are usually taken on the ground may be obtained from the photograph, and photography affords a great variety of construction processes by the application of the inverse laws of perspective.

The above applications of photography are a few taken at random, and will indicate the almost exhaustless nature of its usefulness, and when the photography of natural colors is perfected, its sphere will be still more increased, and who knows but that in a few years the artist's craft will disappear, and that the lens and dry-plate will entirely displace the brush and pallette.

PHOTOGRAPHING DISTANCE.

BY ELLERSLIE WALLACE.

IT has been facetiously said that a proper motto for the photographic art would be, "Distance *lens* enchantment to the view." So it would be, although flatly contradicting the well-known photographic axiom that the camera is a short-sighted instrument.

Out-door views must include greater or less reaches of distance, and in very numerous cases the distance itself is the object of primary interest; the nearer reaches being subordinate. Now, a subject consisting of distance entirely is not always easy to photograph well, but I must not forget to call the reader's attention to the fact that the sky, which will always be included under these circumstances, adds another difficulty.

The two chief troubles in work of this kind are the want of clear delineation in the distant objects, and the great liability to the marring of the picture from some unsightly defect in the film, which never fails to show itself conspicuously on the flat tints and delicate half-shades of the sky and mountains.

To get over the first trouble alluded to, the operator must watch the weather and atmospheric changes most closely, and seize upon the correct time to expose, which will generally be after a hard rain. This, by washing out impurities, renders the atmosphere much more transparent, so that details of distant mountains, such as rocky precipices and isolated trees, will come out distinctly in the negative and greatly conduce to the success of the picture. Decided advantage will often be had in this work from orthochromatic plates used with the screen. By reversing the light's action so as to make the delicate blues of the distance rather non-actinic, or, at least, secondary in chemical power, the foreground objects will impress themselves with vigor upon the plate while the distance is held back, actinically, and cannot solarize or become overtimed.

The out-door worker should possess a number of lenses of sufficiently long focus to give an able-bodied, realistic view, so to speak. Distances taken with wide-angle short-focus lenses are miserable affairs. An important thing, also, is a steady tripod stand. The exposures will rarely or never be instantaneous with orthochromatic plates, at all events, and since the camera will probably be drawn out more than usual so as to accommodate the long-focus lenses, there will be a large surface exposed to the wind, and risk of vibration with doubled outlines in the negative. All this is gotten over by having a thoroughly reliable tripod stand.

By L. M. McCormick.

SUNSET ON THE POTOMAC.

HAND CAMERAS AND "GRASSY LANES."

BY WALTER SPRANGE.

THOSE who pretend to know tell us that it is impossible to obtain good results with a hand camera, and that the percentage of spoiled negatives produced by that much-abused instrument is far greater than the every day, ordinary experimenter with it would care to admit.

For several years I have carried a Scovill detective camera with me, and I find my percentage of failures has never exceeded ten, and they are generally due to causes which can invariably be laid to the operator's over-zeal; for instance, making an instantaneous exposure when the

By W. Sprange.

AN ENGLISH COUNTRY LANE.

sun is low in the afternoon, or of moving objects in the shadow, etc., etc. One rule I endeavor to follow is to use the cap instead of the shutter for portraits and all short focus work.

The instantaneous views illustrating this article will, I hope, be object lessons of a "plea for the grassy lane." These views were taken with a Scovill detective camera in October at Marblehead. I do not think a "tripod" and a focusing cloth would have given any better results.

While the real estate man in the city suburbs, and the farmer in the country places, still insists upon shadeless by-ways, I hope the cyclist and the amateur photographer will quietly observe "Arbor" day, and gently place his sapling tree when possible by the roadside (where it can be planted to remain there), for the benefit of suffering man and beast, as well as the artistic eyes of the future generation. I say "artistic," because I understand that both the cycle and the camera are great educators; that if the career of the devotee to either is watched very carefully, he will be found to be unconsciously ascending a gradual scale of progress in artistic tastes. The cyclist in his selection of cycling rambles, and the amateur in his selection of objects for his negatives, and when all those who are now using these two "machines" have reached the climax, and have abandoned them to their offspring, a nation of artists may be expected as a result of the introduction of them.

PHOTOGRAPHING BLUE SKY AND WHITE CLOUDS.

BY JAMES REËL SMITH.

THERE are probably few amateurs who are not under the dismal influence of some photographic bugaboo. Many a bold hand that will undauntedly take an express train with no heavier calibre than *f*/12 will load himself with isochromatic plate armor at the mere mention of the great blue and white bugaboo. And yet no more imaginary "catch you" lurked under the beds of our childhood; for a skyward exposure short enough to give practically clear glass for the blue will be long enough to yield a dense image of any white clouds in the field.

PHOTOGRAPH OF WHITE CLOUD ON BLUE SKY.

Of a balmy summer day, when snowy clouds roll in billowy masses through their azure sea, a trip up through the scuttle, with a soft rug, a cushion or two, an umbrella, a book, and a well-charged hand camera, is a pleasant change from dusty tramps afield, and the missed trains and cold dinners that follow after.

On such a trip a panorama of fairy architecture and wonderful creation will brighten the eye of the most indolent camerist. A record of the evolution of a single cloud in its

short existence will often furnish a gem for each available plate, from which plates a most enjoyable little pamphlet may be printed, and then bound under some such title as "The History of a Summer Cloud."

These forms not only make unique and charming pictures mounted by themselves, but are readily printed above landscapes.

The following data, relating to the accompanying illustration, may serve as a hint to the inexperienced:

Lens; working $f/48$.
Exposure; $\frac{1}{25}$ s. bright sun.
Plate; Cramer Crown.
Developer; eikonogen, 12 grains per ounce.
Development; about 13 minutes.

For combination printing it is serviceable to have, for 4 x 5 plates, an 8 x 10 frame, with an opaque paper cover having a 4 x 5 opening, near one corner, covered with tissue paper.

It is, perhaps, preferable to print the landscape negative first, and to have its sky dense enough to leave the paper untinted; if the paper is then placed on the cloud negative, so that the lowest part of the landscape horizon sets flush with one of the edges of the opening in the cover, the juncture in the print will not be apparent.

Where a white monument, or the like, projects above the horizon an *unwetted* print, from which the sky has been accurately cut, may be used as a shield while printing the clouds; the shield and the print being kept together by a molecule of mucilage which will dissolve in the first washing and "leave not a rack behind."

By H. Y. Poe.

A BIT OF THE DELAWARE.

DETERMINATION OF THE VALUE OF PHOTOGRAPHIC RESIDUES.

BY PROF. ALEX. LAINER.

A PERFECTLY correct quantitative analysis of silver waste or residues is only possible when the respective solutions or precipitates are of a uniform character.

There are many different methods of analysing to serve our purpose, but it is not at all easy to propose or introduce one of sufficient practical value to be of profit to the professional photographer.

Looking upon the different kinds of residues collected, we find them to consist of chloride of silver, sulphide of silver, etc. More than one method of reducing waste to metallic silver might be suggested, but it is our intention to simplify matters as much as possible, and bring forward one applicable to any or either case.

The principle upon which our method is based is to convert all silver present into silver haloids, to dissolve the precipitates in hyposulphite of sodium, and precipitate metallic silver from that solution by means of caustic alkalies and hydroxylamin. When done, a sample of the precipitate is weighed out, dissolved in nitric acid, and its contents of pure silver determined by volumetric analysis.

The following is the method of proceeding:

The residues are weighed and a sample analysed; to have all the residues in a dry state is desirable but not absolutely necessary.

From different parts of the mass supposed to contain silver, from the top, bottom and sides, spoonfuls are taken, intimately mixed and rubbed down in a mortar, and 10 grammes of the mixture taken out. To correctly determine the average amount of silver contained, is dependent upon conscientious mixing of the different parts taken from the whole deposit. Pieces of glass, corks or fabrics, nails, and other foreign substances should be carefully removed. The weighed-out 10 grammes are placed into a porcelain capsule of about 15 c.m. diameter, and after in

ordinary temperature no further dissolution is noticed, warmed, boiled, and a little hydrochloric acid finally added.*

Heating is done upon a sand bath and should be continued as long as brown vapors are evolved.

The pasty white mass remaining is then mixed with water and the solution filtered. Water is again added and filtration repeated. The precipitate and as much of it as possible should remain in the capsule; sodium sulphite is then added, the solution heated and filtered again. This operation should be repeated as long as pernicious gases escape. The resulting precipitate is now dissolved in from 10 to 15 c.cm. of hyposulphite solution 1:10, which will take up all the silver haloids present.

While with previous operations the filtrate obtained was nothing but wash water containing no silver, the present filtrate, a hypo solution containing much silver haloid dissolved, is collected in a Beeker glass, and the precipitate of silver chloride treated repeatedly with hyposulphite of sodium till a sample of it collected in a test glass does not change color on the addition of a few drops of ammonium sulphide.

All the silver contained in the residue is now dissolved in the filtrate; its value may be determined by subjecting a sample of it to volumetric analysis. From the solution the metallic silver is finally precipitated with hydroxylamin.

* The operation should be conducted in the open, or a strong draft of air, on account of the injurious vapors escaping.

By C. Reid.

ANIMAL STUDY.

SHALL WE EXPOSE TO OUR DEVELOPER OR DEVELOP TO OUR EXPOSURE?

BY EDWARD W. NEWCOMB.

By Morrison, Chicago.

PROFESSIONALS, knowing the strength of their developer and of the light at their disposal in the *atelier*, govern themselves accordingly in making a portrait, turning out, therefore, uniform negatives all the year round. This practice enables them to grow in at least one direction, the study of lighting, and while they may have little experience in trying to bring out points in an undertimed plate, other circumstances are in favor of their advancing more rapidly than one who takes so many chances in exposing and developing that the real cause of failure may never be found out unless by a very severe process of elimination.

The inclination, especially among amateurs, to try to take photographs under any circumstances whatever, and having made a doubtful exposure of the plate, to exert themselves to properly develop it, together with the varied formulas of many new developers which are said to be correct for this or that error of exposure of the plate, lead me to ask consideration of the title of this article.

I am aware that where one form of developer will not develop properly another will; that a plate which was apparently under exposed with a pyro developer may appear over exposed in paramidophenol with caustic alkali, and admit that it is justifiable to use either one to get a perfect result, to pour on this or that chemical to try and make the plate turn out better, and to fuss and bother *ad lib.*, but I am convinced that the proportion of good negatives one gets this way is far below that of one who has timed to the developer. By continuous experimenting in developing to our

By A. Moreno.

IN CENTRAL PARK.

time we will naturally discover new agents that will be more powerful than those we have now, and thus science will receive benefit, although artistic photography may not.

It is, perhaps, a question of what kind of amusement one expects to derive from photography, good results in abundance, or interesting experiences, with few good results. By using one kind, and as near as possible one strength of developer, and timing the plate so that it will develop quickly and perfectly in that solution without any particular care, much trouble and fussing is avoided, and one gets twelve negatives to the dozen plates.

By making shorter and shorter exposures on dark subjects one finally arrives at the point where developing to the exposure is a *failure*, for it cannot be done.

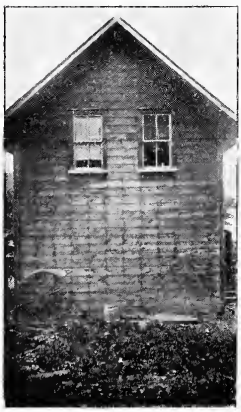
By exposing to the developer in the first place, developing is a pleasure, results are invariably good, and one is not too long in the dark room.

Which shall it be?

PHOTOGRAPHING TO SCALE.

BY A. CLIFFORD MERCER.

IN the summer of 1884 a fisherman's house stood on a sightly spot near the shore of Skaneateles Lake. To transform this house into a summer cottage was the work I took in hand.



SIDE ELEVATION.

Before drawing plans for the summer cottage, the fisherman's house was to be carefully measured: the length, width and height, the sizes of doors, windows, window-glass and other details were to be noted. On arrival, no ladder nor measuring-pole could be had about the fisherman's house. Neighboring houses were far away.

However, four measurements were made, and my work of measurement was done—that is, as to the exterior of the house. By repeated trials a

camera was placed squarely opposite the middle of one side of the house and at such a distance that one foot measured on the house corresponded exactly with one-quarter of an inch measured on the ground glass image. An exposure was made. In the same way an exposure of one end of the house was made.

Later, the finished negatives and unmounted prints were side and end elevations to the scale of one-quarter of an inch to the foot. These, on a drawing-board, were the equivalent of notes in which could be found every required measurement.

FRONT ELEVATION.

Doubtless photographing to scale has been practiced before; but as I am not acquainted with any article about the matter, I have penned these few lines upon the subject.

A mounted print should never be used as a basis of measurement, for in mounting a print the paper is always stretched, and stretched unevenly in relation to the length and breadth of the sheets.

By A. Clifford Mercer. THE SUMMER HOME.

A NEW INTENSIFIER FOR WET PLATES.

BY DWIGHT W. SMITH.

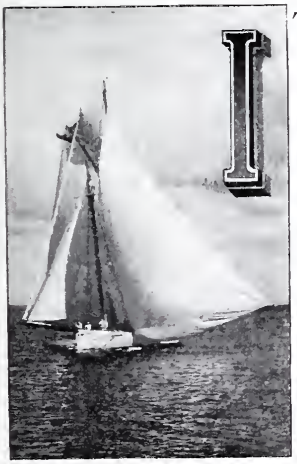
FOR several years I have used oxalate of iron for positives and negatives in wet plate work, and not being able to find any record or any one that thus used it, I am glad of this opportunity to give others the benefit of the discovery.

For line work and half-tone negatives it will be found to be a most valuable help. For lantern slides and transparency work it is superior to anything found. The resultant tones are most pleasing. In the deepest shadows the color may be made a perfectly transparent black, or its density may be increased as desired by a slight use of nitrate of silver by the usual process. It does not clog or fill up the lines in photo-engraving work like other agents. Its absence from stains, its fineness of deposit, together with rapidity and safety, commends it to all lovers of the art. In order to use it, the wet plate is first whitened by the usual copper solution, then well washed and thoroughly reduced by flowing it with the old oxalate of potash and iron developer of our first dry plate experience. The oxalate of potash may be easily made by using equal parts of oxalate acid and potassium carbonate made into separate and saturated solutions, then carefully mixing them, having care that the oxalate acid is slightly in excess. This to one-eighth part of saturated solution of iron mixed just before using will do the work. Where great intensity is needed considerably less nitrate of silver must be used for the usual intensification.

By W. E. W. NIAGARA CATARACTS.

A SUGGESTION TO TRAVELING MEMBERS OF PHOTOGRAPHIC SOCIETIES.

BY J. H. HARVEY.



By H. Latimer.

IT really appears strange that among the large number of traveling members of the different photographic societies in the world, so few interview members of the societies which are established in the towns visited by them.

In the ten years during which I have acted as secretary of the Amateur Photographic Association of Victoria, I have made the acquaintance of only three or four amateurs from the other side of the equator.

Now, the Australian colonies must have been visited by more than this number of members of photographic societies in the northern hemisphere, and it seems an extraordinary thing that so few of them take advantage of the local knowledge possessed by the members of the photographic societies here. Most of the travelers are anxious to see as much and do as much in a given time as possible, and to do it with the smallest expenditure of money, and yet they neglect to make the acquaintance of those who are in the best position to give them information.

If I contemplated a trip to any American or Old World town, certainly the first thing I would do would be to make myself acquainted with the members of the local amateur society, not only on account of the saving of time which would result, but for the sake of enjoying a talk with them. Whenever two genuine amateurs meet there will be found plenty to talk about, and they can hardly converse for ten minutes without imparting some useful information to each other.

Some time ago I read an account of a visit to Australia

which was written by a member of one of the British photographic societies, and could not avoid thinking that had the writer interviewed any of the members of our society, he would not only have been prevented making a few misstatements, but would have been saved much time and useless expense, and would have obtained photographs of more characteristic scenery than that which he described, and this no doubt is the case with scores. How traveling amateurs can neglect so simple a proceeding as the writing of a letter of inquiry I cannot understand; the members of the Amateur Photographic Association of Victoria will, with the greatest pleasure, give all the assistance in their power to any traveling member of a European or American photographic society who brings an introduction from his secretary, and I think that I am perfectly safe in stating that the members of the societies in the neighboring colonies will cheerfully do the same; therefore, I hope that during the coming year we will find a greater number of traveling amateurs taking advantage of the willing aid which their Australian brothers are able to tender them.

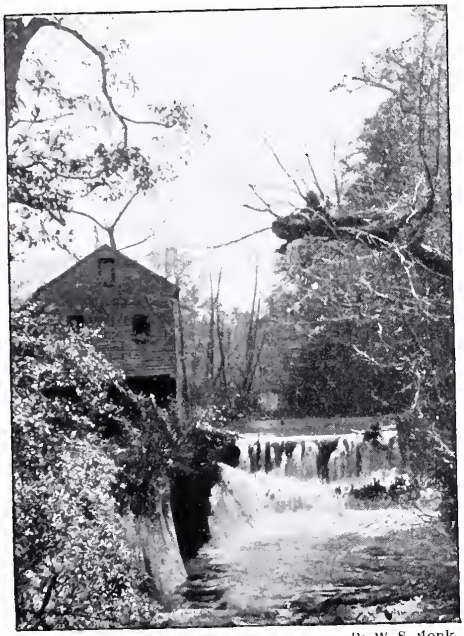
By John Naylor.

A BIT OF DEVONSHIRE.

PHOTOGRAPHING ON METAL.

BY MAXIMILIAN TOCH.

A SOMEWHAT novel method of making positive photographs on watch-cases is described as follows: Make a positive either by contact or in the camera, of the picture desired, on a stripping plate, or if no stripping plates are easily procured make the positive on an ordinary plate. After careful development so that the high lights are clear (this can be advantageously done with bromide), soak the plate after fixing, if it be not a stripping film, in a weak solution of hydrofluoric acid contained only in a rubber or a leaden tray. If a stripping film be used this procedure can be dispensed with. After the plate has been well fixed and washed, strip the film when it is dry and cut it to fit the watch-case or the object on which it is to be affixed.



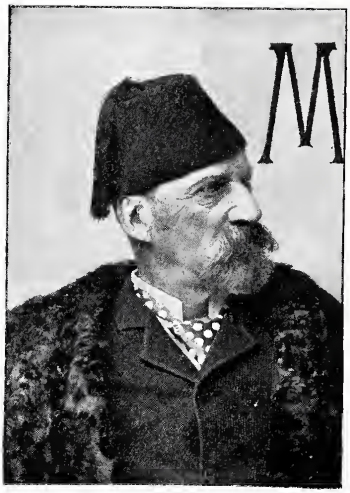
OLD MILL, SELMA. By W. S. Monk.

Now dilute some rubber cement (Para rubber dissolved in 76 deg. naphtha) with about five parts of naphtha, and pour a drop or two on the watch-case so that it spreads evenly. In a few minutes the naphtha will have evaporated and will leave a thin film of rubber which is slightly sticky. The stripped film must then be laid deftly on the object and pressed into place with a wad of cotton or smoothed out with

the fingers, and in an hour it is firmly fixed into place, and with a little care will last indefinitely. This method of transferring positives does not apply to watch-cases alone, but to many objects of a similar nature. Lamp-shades admit of pretty and unique decorations in this fashion, and sheets of burnished metal upon which landscapes or portraits have been transferred, particularly the former, attain a brilliancy which imparts to them a realistic appearance.

PRIVATE CHARACTER OF ARTISTS' MODELS.

BY NAPOLEON SARONY.



NAPOLEON SARONY.

MOST people outside of the artistic profession seem to have a vague impression that artists' models are not morally just exactly what they ought to be. This impression seldom has a corresponding expression, for nobody has yet ventured to criticize publicly, and it is therefore difficult to determine what the impression really is. At any rate, when these people find themselves by chance in the presence of an artist's model, either in or out of the studio, they look at her askance. In speaking of a model to one another they exchange significant glances, and when they have the privilege of actually conversing with a model, they do so with an ill-disguised air of curiosity as if they were speaking to a freak. Indeed, they consider a conversation with a real live model an important event in their lives, and refer to it ever afterward as if they had spoken with some very great and important personage. These ideas are entertained, I may add, only by people who know nothing whatsoever about models or their calling.

As I have made the nude in art a specialty, I have formed, and very naturally, a large acquaintance among models, and I am glad of this opportunity to tell what I know of them, hoping that this may lead people to a better understanding of a class of women whose calling, to say the most, is unconventional. Their calling, it is true, is unconventional according to the modern code of morals, and if this be an offence, it is the only one of which they are guilty. Their business has been termed abnormal; but it is not abnormal, because art makes professional models an absolute necessity.

I am speaking now, of course, of models who pose undraped; and, as a matter of fact, it is only in exceptional cases that such a model is not a modest and good woman. Furthermore, I have always found them bubbling over with health and animal spirits, always radiant, buoyant, honest and happy hearted. To the uninitiated this may seem strange, and further detail may be asked for.

If you are a student of human nature and will follow a model's course from the beginning, consulting their own thoughts and feelings in the matter, you will find it a most interesting psychological study.

In the first place, what is her main reason for becoming a model? I answer, simply to earn a livelihood. She does not pose for hours, sometimes weary and aching hours, every day, for pleasure, or the love of art. But in most cases she does it for the same reason that she would stand behind a dry-goods counter—to earn her living. And this is her only reason. And let me add that she makes more money in the studio, double and treble than she would in the store. It is pre-supposed, of course, that she possesses a good figure, and good looks and natural grace; in fact, all the personal requisites of a professional model. Now she has secured an engagement, very likely with some artist whom she knows. At first she poses only for the draped figure, or perhaps only for the head. She finds this congenial and an easy way to earn fifty cents an hour; above all there is no publicity. Every artist, by the way, holds the names and identity of all his models in sacred trust. Well! in a short time, if the

model has intelligence, she will begin to study her employer; will try to perceive his ideas, his words and his conceptions; eventually, she will do all she can to interpret them by suggestions of poses. Thus she comes closer and closer to the artist's work and finding in it a personal interest feels that, in a measure, his success depends upon her. At the same time she learns that she is to him only a model, and he to her only an artist, and that he thinks no more of her personality than he does of the costume or other inanimate details of his picture or statue. Then one day he needs an undraped figure, and it rarely happens that she will not pose in the manner desired, as a matter of course. The artist is to her now simply what a mirror is to any woman. At the end of the sitting, when she has ceased to be the model, and is no longer required as a necessary accessory to the artist's work, she vanishes, and in a few moments goes on her way as an ordinary business woman in a work-a-day world.

From what classes are models recruited? In European countries from two classes; either from a family of models or from a family which has met with financial reverses.

The best models are found in France, Italy and America, because, in these countries, they are recruited principally from these two sources and are therefore most intelligent. A family of models, by the way, is one in which father and mother have gone from models themselves to janitors in studios and galleries.

The regular pay for a model is fifty cents an hour, and she earns anything from that amount to five dollars a day according to how much she is in demand. I know of more than one model, myself, who earns in this way as much as thirty dollars a week, and this is the more extraordinary when it is learned that there are in New York City alone as many as five hundred models.

It has been said that five or six, nay, ten and twelve models are required to complete one figure. One for the back, another for an arm, or a shoulder, and so on. This seems to me, if not an exaggeration, at least unnecessary. There are more good models than people believe. I have had models who were nearly perfect. As a model is not the

whole truth, but a suggestion of it, I use my imagination, as well as my knowledge of drawing when a model is not beautiful, and make her beautiful.

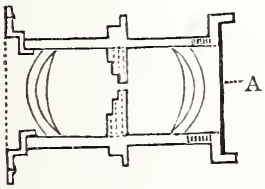
In her daily life, in her home, among her friends and socially, the professional model lives quietly and happily, pursuing her way just as any other honest young woman earning an honest livelihood. You see, a model's family and personal friends know her; and they know that Marie, the artist's model, is no different from Marie, the milliner.

It is not unusual for an artist to marry a model. I know of four artists in this city alone each of whom chose a wife from among his models. And each of these artists declares his wife to be the best and dearest of wives.

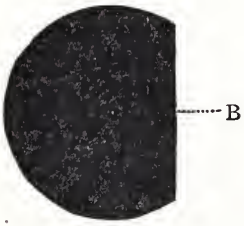
"DOUBLES" SIMPLIFIED.

BY VAL STARNES.

I HAVE long wanted to try my hand at double photographs—so-called—but being awkward in the use of tools have always doubted my ability to construct the necessary apparatus. Recently, however, the idea occurred to me that an easier method than the one generally in vogue might be discovered, and I set to work to solve the



No. 1.



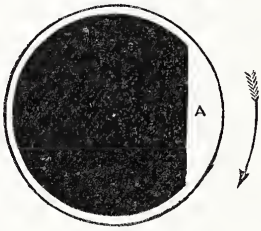
No. 2.

problem. The method—which has proved very simple and satisfactory—I herewith lay before the readers of THE ANNUAL.

Take a light card mount and carefully cut from it a disc that will fit snugly inside the rim of the hood of your lens, resting against the circular interior shoulder. (No. 1, A.)

Cut from this, in a straight, true line, a small segment. (No. 2, B.) The exact amount to cut off you can determine by slowly thrusting with one hand a card with a straight edge across the lens hood, looking the while at the ground glass; when the shadow has crept *almost* to the centre of the focusing screen, hold the card firmly in place and notice how much of the circle of the hood is covered by it; cut from your disc a segment corresponding to the amount *left uncovered.* Don't let the shadow creep *quite* to the centre of the ground glass, for you might go the least bit beyond, and an unexposed strip would result. Now paint your disc a dull black; loosen the hood of your lens on its threads, so that it will revolve easily and freely, and you are ready for business.

Get your focus and then place disc in hood of lens, straight edge perpendicular. (No. 3, A.) Cover lens with



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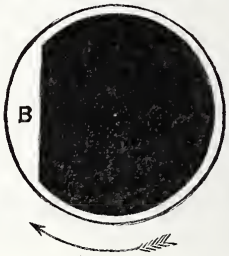


No. 4.

cap or shutter; insert plate-holder and draw slide; pose your figure *directly in front of uncovered portion of lens;* expose. Next, without touching disc, slide, or anything but the hood, gently revolve the hood on its threads one-half turn (No. 4, B), and pose your figure on opposite side; expose. The trick's accomplished.

This method leaves nothing to be desired with shutters that work between or behind the lenses. When the exposure is to be made with cap, you of course cannot see the disc when the cap has been replaced after the first exposure. In that case the best plan is to loosen the hood only an exact half turn, testing carefully before trying to make a picture, so as to be sure that the edge of the disc falls in

each instance truly perpendicular. Then all that is needful when the cap has been replaced after first exposure, is to tighten up the hood on its threads, and the aperture will perforce come into its proper place on the opposite side.

Of course covering up the larger part of the front combination of the lens in this way reduces the amount of light admitted to the plate a great deal—about from *f*/8 to *f*/22, as well as I can judge. But the only drawback resulting from that is the increased length of exposure rendered necessary, for while our disc acts like a stop in decreasing the quantity of light, it equally partakes of the nature of a stop by increasing the depth of focus. (That some slight distortion also follows is, perhaps, true, but it is wholly imperceptible.) It will, therefore, be seen that we can use the lens "wide open" (*f*/8), and proceed on the supposition that we are working with stop *f*/22, which with a rapid plate does not require an excessive exposure. Nor is a long time exposure to be greatly dreaded, as a little masking in printing will remedy any inequality in density. My initial effort was upon a very old, slow, cut film, requiring 14 seconds, yet the negative "printed itself."

Since not quite one-half of the plate is obscured during each exposure, it might appear natural that a central strip would receive a double exposure, but in reality such is not the case. The light fades gradually—after the manner of a vignette—from the edge of the plate to the centre, and the double time that it acts about the medial line merely offsets its feebleness in that quarter, giving an even negative all over.

With the above simple contrivance in his vest pocket, the photographer is prepared to take a "double" at any moment and anywhere. There is no danger of jarring the camera, for nothing is touched during the operation but the hood of the lens. By utilizing still further the principle of revolving the latter on its threads, the upper and lower parts of the plate, taken longitudinally, are as much under control as the right and left hand portions—indeed, the chances that it offers for cutting off the light from any section of the plate at any angle are numerous.

I sincerely trust that this communication may enable many of my brother—and especially my sister—amateurs to readily and cheaply "double" the enjoyment that they now derive from our art—toward which laudable end the ANNUAL so ably contributes.

CLOUDS IN LANTERN SLIDES.

BY JOHN NICOL, PH.D.

THE time is coming, if it has not already come, when a lantern slide with a blank white sky will be an anomaly, and printed-in clouds will be universal. Many methods have been proposed for the accomplishment of that desirable object, and several are being practiced with more or less success, but the following is, I think, better because, while efficient as the best, it is simpler than any, and cheaper than most of them.

The method is not applicable to all kinds of negatives, as the skies should be tolerably opaque and the outline not too complicated, although I have not yet come across one that, with a little patience, could not be *skied;* and the slide must be made by camera copying, and not superposition.

Place the negative against a pane of glass in a window, glass side out, and press against it a piece of paper thin enough to be translucent, and cut to the exact size of the negative. Then, not necessarily with any particular care, run a pencil line along the outline of the landscape, separating it as it were from the sky. Paste this onto a sheet of very stiff paper, or thin card-board—anything in fact that will not warp or cockle—and when dry, cut along the line with a sharp knife or pair of scissors. The lower or landscape half is to be used as a mask in the following way; the only other things necessary being a suitable cloud negative, and if that should be of a size different from the negative to be copied, a plate of clean glass, exact size.

The negative is placed in proper position in the copying camera, and a pencil mark made so that the cloud negative in its turn, may be easily placed in the same position. After

the necessary exposure, the lens is capped, the negative removed, and the cloud negative substituted. The mask is placed behind it, and the cap again removed for the necessary time. Should the cloud negative have been lighted from a direction opposite to that of the negative, the simple remedy is to turn the film side of the former out instead of in.

When the cloud negative is of a size different from that of the negative, it is sometimes difficult to find the exact place for the mask, but the difficulty is easily overcome by placing the plate of clear glass in the place of the negative, placing the mask over it, and the cloud negative outside.

Faintly indicated clouds are generally more effective than those that are more pronounced, but a few experiments will enable any good slide maker to so expose as to get just what he desires.

ON THE COMPOSITION OF COMMERCIAL SODIUM SULPHITE.

BY DR. MUMME ANDRESEN.

TO make chemically pure sodium sulphite, answering to the formula $Na_2SO_3 + 7H_2O$, is not a very easy task. The commercial article does not at all correspond with that formula, notwithstanding the same characteristic form of crystallization, its composition does not even approximate that of the pure article. Neutral sodium sulphite has, however, become such a very important factor in the compounding of the modern organic developers that information on the subject should be welcome to every practical photographer.

The better brands of commercial sodium sulphite contain from 80 per cent. to 90 per cent. of the pure salt; the inferior but from 70 per cent. to 75 per cent.

What are the substances the commercial sodium sulphite is adulterated with?

Sulphites, the acids as well as the neutral, are invariably made of sodium carbonate and sulphurous acid. Carelessness

in the manufacturing leaves carbonate within the lye; it crystallizes with the sulphite, and cannot be detected by superficial examination. There are many kinds of sulphites containing carbonate in various proportions, others, few of them, are perfectly free of them. This fact is of importance when compounding developers. They are durable when carbonate is totally absent, as with amidol, but when but a trace of it is present, the solution decomposes rapidly, and causes the plate to fog.

This fact explains very well why the action and behavior of amidol is so differently judged of by different investigators. With amidol the employment of sulphite of constant composition is an absolute necessity.

Sodium sulphate (Glauber salt) is invariably an admixture to the commercial sulphite, and must naturally be so when we bear in mind how easily and rapidly sulphite in aqueous solution is changed to sulphate when forcing air through the solution or exposing it to its influence has the same effect. A solution of 50 grammes of the pure salt in 250 c.cm.³ of water contained after an exposure of 14 days but few traces of the chemically pure sulphite. As neutral sulphite is made only from aqueous solutions the conditions to form sulphate are evidently there. Sulphate of sodium is not a preserver of developing agents; its presence with sulphites acts injuriously upon the progress of development, it retards. Much sulphate injures the durability of the solution, because the quantity of sulphite is not sufficient to prevent the developing agent from being oxidized. Continued experiments have pointed out the presence of a third salt in commercial sulphite, namely, basic sodium hyposulphate, $Na_4S_2O_7$ (sodium dithionate).

The following example may illustrate the composition of inferior sodium sulphite:

Water	50.00	per cent.
Sodium sulphite	36.71	"
Basic hyposulphate of sodium	9.78	"
Sodium sulphate	4.63	"

The occurrence of hyposulphate in commercial sulphite appears to be quite reasonable when we consider how easily

that salt is formed when aqueous sulphite solutions are treated with weak oxidizers.

Hyposulphate of sodium, in regard to the oxygen contained therein, stands between sodium sulphite and sodium sulphate. The latter is the ultimate product of oxidation.

To learn whether hyposulphate of sodium has preserving properties I prepared, first, large quantities of the substance in question. Permanganate of manganese has been generally considered to be an excellent oxidizer, but I found in this case peroxide of lead, boiled with sulphite solution, to react most energetically.

$$2Na_2SO_3 + O = Na_2S_2O_6 + Na_2O$$

Hyposulphate of sodium is not a preserver; its presence with sulphites acts injuriously, and the basic salt is objectionable for more than one reason, not only on account of its greater alkalinity, but also it displaces the sulphite in the composition, and this is one of the reasons why the observations of different investigators have resulted so differently.

When sodium sulphite is transformed into sulphate the very interesting fact occurs that through the influence of the oxygen upon the salt, from the weak alkaline reacting salt, another salt of strong alkaline reaction is produced.

$$2Na_2SO_3 + O = Na_4S_2O_7$$

and that by continued oxidation a perfectly neutral salt

$$Na_4S_2O_7 + O = 2Na_2SO_4$$

is formed.

A great many erroneous ideas exist on the efflorescing effects when sodium sulphite is exposed to air. Generally the idea has been brought forward that, after thorough efflorescence of the salt, and when it has been reduced to white powder, the salt has changed its character—becomes sulphate through oxidation. Entirely wrong in every respect.

The sodium sulphite we subjected to our experiments was of the following constitution:

Water	50.00	per cent.
Sodium sulphite	36.71	"
Basic sodium hyposulphate	9.78	"
Sodium sulphate	4.63	"

After exposing the salt to the air for six weeks it had effloresced into a white anhydrous powder of the constitution

Sodium sulphite	69.37	per cent.
Basic sodium hyposulphate	23.53	"
Sodium sulphate	8.71	"

In all formulæ for photographic developers much stress is laid upon the use of fresh, not at all effloresced sodium sulphite, and correctly so, for when efflorescence is going on the constitution of the salt is changed into new products not at all in conformity with the pure crystallized salt nor corresponding with the properties the formula assigns to it.

I must yet speak of a product deserving much the attention of all practical photographers, namely, the anhydrous or exsiccated sodium sulphite.

Crystallized sodium sulphite may be freed from its water of crystallization without interfering with its constitution or subjecting it to oxidation. The product obtained has several advantages over the crystallized salt:

1. The exsiccated sodium sulphite* is certainly more durable, as through the loss of its water of crystallization a change of its constitution is scarcely possible to occur, for which reason it is much favored by tourists.

2. The volume of the exsiccated salt is less than one-half of that of the crystallized. When dissolved, the exsiccated salt liberates heat, the crystallized cold; a great advantage when the developer is to be used at once.

The demands reasonably to be made upon crystallized sulphite is to respond to the formula:

$Na_2SO_3 + 7H_2O$, and for the exsiccated Na_2SO_3.

The absence of sodium carbonate is in all cases of absolute necessity.

* Known in America as granulated sodium sulphite.—TRANSLATOR.

TESTING GELATINE PLATES.

BY CHAPMAN JONES.

WHEN the testing of a gelatine bromide plate is spoken of, the idea generally conveyed refers to speed, and to nothing but speed, so that one who knew but little of the matter would be justified in imagining that speed was the only quality that photographers cared anything about. And this is not as it should be, because there are several other qualities of plates prepared for negative making that are often of more importance than their speed. The chief of these, perhaps, are, the light absorbing power, the density giving power, and the coarseness of the particles of silver salt. The light absorbing power ought to be such that all the photographically active light that falls upon the plate during any exposure shall be absorbed within the film and be available for the making of the image. If any of the light gets out at the back of the film, it causes trouble, not only because it is in the wrong place and may affect the sensitive salt where it ought not to be affected, but because it is lost from the image, and the possibilities of development are thereby curtailed. The density giving power of plates is exceedingly important, as sometimes it is desirable to get greater contrast than exists in the subject, and sometimes far less, and if this property of plates could be expressed, it would be possible to suit the plate to the work without so much preliminary trial.

But it cannot be too carefully borne in mind that the speed, the light absorbing power and the density giving power, can never be estimated with exactness if they are to be expressed by a single number or proportion. To make any pretensions to exactness these items must be expressed as curves indicating the ratios for each part of the spectrum. There can be no useful exactness in the estimation of any effect of light, so long as lights of different refrangibilities mixed in unknown proportions are jumbled indiscriminately together. It is useless therefore to attempt great refinements in any of these estimations until light of a practically

definite wave length can be dealt with alone. In the matter of speed, we have in commerce methods by which useful comparisons may be made though they are but approximate, and what we now need, is some method of estimating and expressing, in a similarly approximate way, the light absorbing power, and density giving power.

The size of the grain, and granularity of the image given by gelatine plates, become important in enlarging, but very much more important in scientific work when fine detail is desired that will bear examination under a microscope. But it does not follow necessarily that the size of the particle must limit the fineness of the detail, as it may be imagined that a part of a particle may be developed and the remainder of the same particle removed by fixing. These questions need investigation.

PARAMIDOPHENOL.

BY J. A. VANDERPOEL.

DURING the past two years the mind of the average photographer, be he professional or amateur, has been in a state of confusion caused by the multitude of new agents which have been brought to his notice as developers, and which have in many cases been put on the market with more or less success. In this time one of the first introduced developers of the amido group has been holding its own with quite a number of the older workers, who dislike change and experiment with their multitude of formulæ and uncertainty of result.

This agent, paramidophenol, if rightly used, possesses all the good qualities as to rapidity, detail, freedom from stain, etc., claimed for the newer developers, and has even greater keeping and density giving powers.

The following original formula has been found by the writer economical and suitable for all classes of negatives, and all brands of plates and films, giving latitude of exposure, and, if desired, density proper for carbon and platinotype workers, leaving at the same time a clear crisp nega-

tive with plenty of detail in the shadows that will make a quick print on aristo.

Mix as follows:

A.

Boiling water	40 ounces
Sulphite of soda, granular	3 ounces
Acid, citric	1 drachm
Paramidophenol hydrochlorate	200 grains

When cool, add—

Hydrochinon	80 grains

B.

Water	40 ounces
Ferrocyanide of potassium	2 drachms
Carbonate of potassium	2 ounces

C.

Bromide of potassium	10 per cent. solution q. s.

For use take: Water, 3 ounces; A, 1 ounce; B, 1 ounce (few drops of C if necessary). When through developing, do not throw away the used developer, but filter into a bottle for future use, strengthening before using again by adding half an ounce of A and B, using in this way an evenness of results that is surprising and most satisfactory will be obtained.

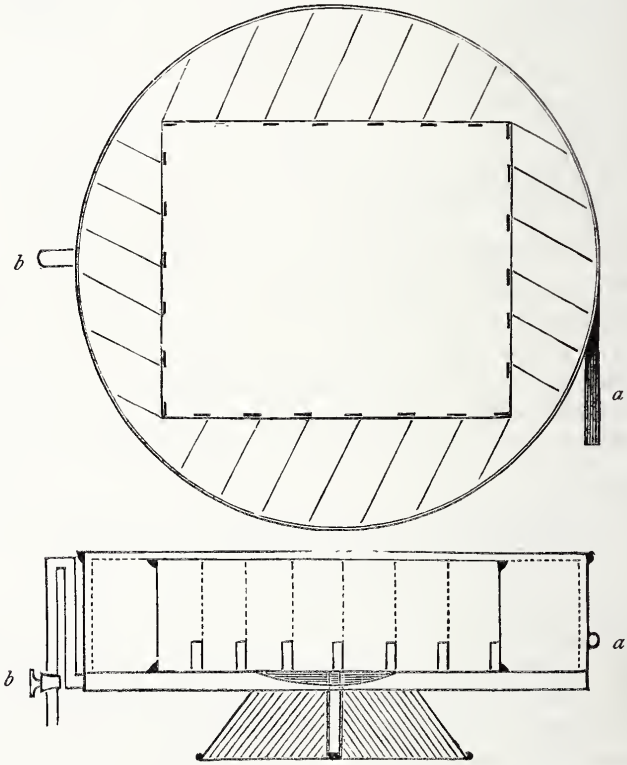
AN EFFICIENT PRINT WASHING MACHINE.

BY HORATIO YEATES.

DEVICES for washing prints are very numerous, but the one about to be described will, I think, take a leading place. It was made to the order and design of Mr. Russell Young, of Hobart, Tasmania, who is a very successful amateur photographer.

It consists of two parts, a washing tray, in which the prints are placed, and a circular trough, in which the tray can revolve (the size of the affair will depend on the size of the largest prints to be washed); in this case the sizes are, tray 11 x 9 x 3 inches, and is built on a circular plate 15½ inches diameter; this has a spindle fixed on the bottom in the centre, on which it can revolve freely in the circular trough; this latter is 16 inches diameter and 4½ inches deep, and has a stand in which the spindle of the tray fits.

The tray, of course, is for holding the prints; both sides and ends are perforated along the bottom, and vanes are fixed at each hole, as shown in the sketch; the inlet, *a*, for the water, is so arranged that the jet impinges on the vanes



and so causes the tray to revolve, while the direction of the vanes leads the water into the tray through the perforation, thus insuring a constant current of fresh water over and through the prints. At the other side is the usual syphon for carrying off the water.

REPAIRING LENSES.

BY J. R. SWAIN.

IN nearly all the modern portrait and landscape lenses the front and back combinations consist of two lenses each, cemented together to prevent chromatic aberration. Sometimes the cement gives way or turns a milky white, thus rendering the lens unfit for use.

The damage is easily repaired. If the lenses are not already separated, heat them gradually over a lamp until quite warm, when they will come apart without any trouble. Clean each lens thoroughly with a piece of chamois skin and alcohol. Now a drop or two of Canada balsam is applied and the lenses pressed firmly together. It is best to slightly warm the lenses before applying the balsam. Lay away in some cool place free from dust for a day or two till the cement has had time to set. If the job has been carefully done the lens will be as good as new.

TRIMMING PRINTS.

BY REV. F. C. LAMBERT, M.A.

I AM quite unable to account for the fact that in every photographic exhibition I have ever seen there has been one (often more than one) print so badly, faultily trimmed, that it thereby lost some of the merit it otherwise might have had.

1. One of the most frequent mistakes is that of trying to get too much out of every negative—of trying to trim all prints to one uniform size, irrespective of their various subjects and quality. A case of spare the knife and spoil the print. A moment's thought must show us that the best men cannot always work up to one uniform standard of excellence, and experience shows us that the experts are those who use the knife most freely—cutting down a 12 x 10 print to perhaps 6 x 4, or even smaller.

2. Next, we may often see a disregard of natural hor-

izontal lines. The sea horizon line a quarter of an inch higher at one end than at the other; architectural subjects of building, which in nature are vertical, are so trimmed that the spectator is led to surmise an earthquake must have visited the neighborhood.

3. Again, not a few prints have marginal lines which are obviously not at right angles. Their opposite sides may be parallel, and yet the outline is not a rectangle, but a parallelogram.

4. Many of the glass cutting shapes are far from true, either as being rectangular or having straight lines. Some are seriously curved.

5. Raggy edges, due to carelessness, either in using a blunt knife, paper not quite dry, cutting on too soft a surface, etc., are seen far too often.

Obviously no hard and fast lines can be set forth as to how much or how little of the print should be cut away, but whatever is removed, let it be done properly. Let us have the lines of the picture true to nature, the corners square (rectangular), the edges straight and clean, and the print also properly mounted and framed. Quality is better than quantity in photographs.

WHAT IS A NATURALISTIC PHOTOGRAPH?

BY P. H. EMERSON, PH.D.

1. A PHOTOGRAPH true to the sentiment of Nature.

2. A photograph giving the visual *appearance* of things as truly as possible.

3. A photograph in which the *foci* of different planes is so arranged as to help give this truthful appearance.

4. A photograph that is decorative, in addition to the above qualities.

A NATURALISTIC PHOTOGRAPH

is not merely a photograph with one plane sharp and the rest fuzzy, as asserted by the muddle-headed idiot.

Is not merely a blurred view, as suggested by the incompetent operator.

See article, "What is a Naturalistic Photograph?" By Dr. P. H. Emerson.

A NATURALISTIC PORTRAIT.

(Taken in the open air with a tele-photographic lens.

Is not every photograph printed on mat surfaces, as suggested by the unintelligent.

Is not a "fuzzy" thing, as hinted by the back-biter.

A naturalistic photograph requires a man of strong artistic sense to produce, and a refined artist to appreciate, but it is doomed to the sneers and contumely of the Chicago and purely British section of the photographic press Philistines who have sneered in their day at Whistler

SUBTERRANEOUS PHOTOGRAPHY.

BY J C. BURROW.

THE chief difficulty in underground photography lies as would naturally be imagined in the illumination. To do this satisfactorily by artificial means requires much care and thought. My recent experiences in photographing the workings of a Cornwall tin mine may prove interesting. After preliminary trials with cameras of various dimensions a half plate was chosen on account of its lightness, portability and moderate size, the latter being specially important in confined situations. Double plate holders were employed, for although there was no danger of light when the candles were extinguished, and plates could be

Photo by J. C. Burrow.

A TIN MINE MILL.

safely changed, yet it was found impossible to keep the hands clean. A Zeiss Anastigmat, Series III., was used and gave beautiful results. A sliding tripod was also found very useful as the camera had often to be tilted at an angle of 60 degs., and the front leg tied to a rock to prevent over-balancing.

It is needless to detail the incidents attending the transport of apparatus from surface to the bottom of an inclined

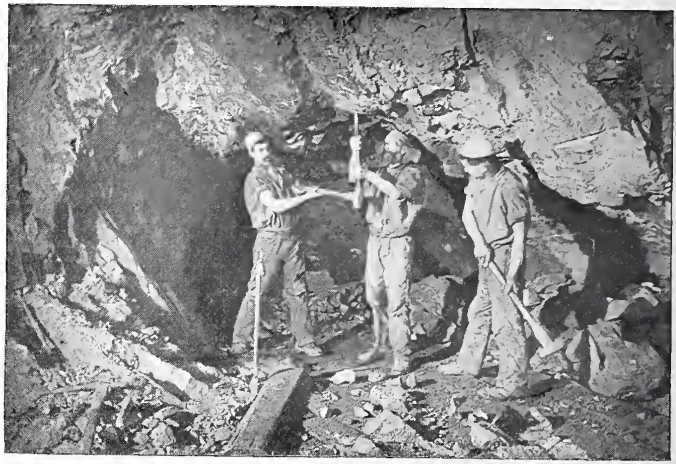


Photo by J. C. Burrow.

BORING AN UPPER IN A CORNWALL TIN MINE.

shaft half a mile below. Some were unpleasant, others amusing.

Readers intending to attempt underground photography must not be discouraged when staggering through the semi-darkness with a hydrogen cylinder under one arm and a pair of lime-light burners under the other, if they fall head-long into a pool of water by the side of the level. Nor must they lose their self-control when, after carefully selecting the driest spot available to open the magnesium powder tin for recharging the lamps, a "flush" of water from some unknown source falls into the tin as soon as the cover is off, instantly dropping the curtain most effectually upon the remainder of the day's programme.

The writer, after repeated unsatisfactory experiments with different flash lamps, designed a pair of triple flash arrangements, which have proved exceedingly satisfactory. The high temperatures of the deep mines caused camera and lens to be covered with condensed vapor for some time after the scene of operations was reached, a source of much bother.

A state of readiness having been arrived at, the word to "light up" produced a powerful flash from the lamps and ribbons simultaneously. The lime-lights were previously

Photo by J. C. Burrow.

ENGINE SHAFT IN TIN MINE.

at their maximum intensity. An exposure of from two to four seconds generally gave the best results. If everything appeared favorable in the strong light, another subject was sought, for a second exposure in the same place on the same day rarely gave good results, owing to the "fog" caused by the products of the combustion of the magnesium.

The illustrations which accompany this article will serve better to show the results obtained than any word description.

CHILD STUDIES.

BY WALTER E. WOODBURY.

"They are idols of hearts and of households;
They are angels of God in disguise;
His sunlight still sleeps in their tresses;
His glory still gleams in their eyes."

Copyright, 1893. ISABEL. By B. J. Falk.

THE successful portraiture of children may with truth be said to be an art in itself, an art that many fail in and a few excel. "The greatest reverence is due to the child," wrote Juvenal, the celebrated satirist, but "I wonder how long his reverence would have lasted had he attempted the photographing of one," was the query of a more modern writer and a photographer.

It is certainly curious to note the antipathy to children displayed by some photographers. Many would sooner climb the steepest mountain with their whole kit on the back and photograph the summit than remain in their studio and attempt the portraiture of a "mother's joy." Yet again, there are others who delight in exercising their skill upon such subjects, and these men achieve success and reap a rich harvest, for it is through the child that the parents are gained.

A great deal depends upon the qualities possessed by the photographer. He must be of a kind and gentle nature, one of those men to whom children take to instinctively. How common this difference between man and man. A child will run into the arms of one man with the greatest willingness and confidence, while the very appearance of another will frighten them and cause them to cling fast to those they know.

Patience is another virtue that is absolutely essential, for

without a large stock of this the photographer cannot hope to succeed. If he finds himself losing his temper he must be able to gracefully retire to the dark-room, unburden himself, and return to the gallery with a happy, smiling face.

Copyright, 1892. MINNIE. By B. J. Falk.

If the photographer of today, with his cyclone plates and lightning lenses, would contrast his position with that of his earlier brethren he will find he has very much to be thankful for, and that compared with a few years ago, the photography of children is a mere pastime.

However great the care, attention and patience that is necessary, is there not a full compensation in the charms of childhood, the pretty pictures that can be made, the rosy lips, sparkling eyes, curly, wavy hair, and the artless smile of the little one? Are not these worth any trouble to secure? One glance at the pictures that illustrate this will suffice. Falk is no magician, but a man who has learned how to secure real pictures of childhood in all its aspects.

Copyright, 1892. ROSITA. By B. J. Falk.

The most successful photographer with children is the man who has a kind

heart and a warm love for them. Mr. Geo. Rockwood, writing upon the subject, says: "No man can make a speciality of children. The children must make a speciality of him. It is a pure case of 'selection' or nature's admiration. The children must love him. They have intuitive perceptions and cannot be deceived by smooth words and pretty gifts any more than the animal. They know their affinities by a nicer, sure test which they cannot express. Now, confidence between the artist and his subject is the first element of success not only with children but quite as much with adults. Art is being so much studied and cultivated in the present day that it often crops out in the dressing of children, and the charms of the little maids and masters are much enhanced by picturesque costumes. While child beauty unadorned and undraped is the more classic, the present style of dress in vogue among the cultured and wealthy is often in the highest degree artistic. To me all are comely—if not always in external beauty.

Copyright, 1893. RITA. By B. J. Falk.

Copyright, 1892.

Photo by B. J. Falk.

CHILD STUDY.

There is a sweet simplicity to childhood which wins my heart, and I am free to say that they develop the best efforts of my artistic skill, and I prefer them as a field of effort."

Copyright, 1891. By B. J. Falk.

LITTLE TUESDAY.

When a child is brought to the studio, the first duty of the photographer is to let the little one feel at home. There must be no fear, no constraint visible. Enter thoroughly into the spirit of the thing, and do not be ashamed to lose your dignity and self-opinion for a little while.

Children, as a rule, do not possess the vanity of the adult who, when he or she is sitting for a portrait, is all the time trying to put on an angelic expression, usually resulting in an unnatural smirk or idiotic smile. To get the best expression with children, they must be interested. Watch a child blowing soap bubbles, for instance, and you will see a hundred of the cutest expressions imaginable, nearly every

Copyright, 1893. By B. J. Falk.

CHILDHOOD.

one of which would make a picture. With a lens working with a wide aperture, a very rapid plate, and a well-lighted studio, there should be no difficulty in securing instantaneous pictures of these. The studio light, however, should not be too glaring, as it must be remembered that the eyes of the little ones are not always as strong as our own, and an unnatural effect may be the result. Every means, in fact, should be taken to add to the comfort of the child.

Copyright, 1892. REFLECTIONS. By B. J. Falk.

In conclusion, I will recommend every parent to have their children's portraits taken at every opportunity, and to go to a photographer who is an artist and who will take trouble to secure the best picture, for one never knows how soon we may lose our treasures. Poor little Rita, for instance, whose portrait appears on another page, met with a terrible accident some few days after Falk made the picture, and was burnt to death. Would not the sorrow of the parents have been enhanced had they omitted to secure a permanent likeness of their darling?

I am still a bachelor, but I hope some day to have children of my own, for I love the little ones and their winning ways, and it will be my chief delight to keep pictorial records of their happy childhood days.

Copyright, 1893. By B. J. Falk.

KATHERINE.

But there are children and children. When I speak with loving affection of the child, I refer to the one brought up by a sensible father and mother, and not the spoiled child of misguided parents, of which there are, unfortunately, very many in this country, the *enfant terrible*, the annoyance to all and the cause of the misery and despair of the photographer when brought to be photographed, the futile attempts, the spoiled plates, and ruined articles, until the artist, like Gloster, in King Lear, cries out:

> "Oh, that I could see
> The winged vengeance overtake such children."

By W. S. Monk.

MOONLIGHT ON THE ALABAMA RIVER.

By Dr. Johannes Meiner.

MORNING MIST ON THE JUNGFRAU.

AT THE SEASIDE.

BY JOHN M. BEMIS, M.D.

By Morrison, Chicago.

THERE is no branch of amateur photographic work, it seems to me, that is undertaken simply for pleasure and with the anticipation of pleasing results to follow that can excel the taking of marine views—glimpses of blue salt water, I mean—where every incoming wave bears on its curling crest tidings of the older and more picturesque civilizations, and every receding one runs out to return by and by laden with historic folk lore.

The position of the photographic enthusiast by the gently heaving sea is quieting as well as picturesque, and gives him plenty of time to look about and to absorb, if he be anything of a reader, some of the tales the waves bring him and to interpret them aright and so place himself more nearly in sympathy with history and art.

He places homely log cabins upon the shore and fences them in by a background of virgin forest; he puts about them stout Dutch settlers from the shores of the Zuyder Zee—all booted and belted and hatted; or if upon Cape Ann, the Mecca of marine artists, the Dutchmen resolve themselves into straight laced Puritans with shorter belts and longer faces; here and there a friendly Indian comes in fantastic garb to barter corn for the coveted articles of the colonists; square-bowed, high-pooped ships ride at anchor upon the lazy swell, and nearer shore a fishing shallop glides slowly along filled with the morning's catch of silvered fish; the ring of the woodman's axe or the call to noonday meal are the only sounds that awake the ear, for one soon grows accustomed to the sea's gentle swell.

Such day dreams tend to artistic work; who can hurry with these phlegmatic people of by-gone days about him? No mixed plate-holders or lost tripod screw here.

Photo by J. M. Bemis.

MARINE STUDY.

Soon the whole aspect of the scene changes. The freshening breeze brings on the hurrying waves laden with more modern tales. The sky is overcast and hurrying clouds fly to and fro with threatening aspect; the trees on shore bend to the force of the wind and wave their branches with nervous anxiety. Now is the time for us to hurry and with rapid fingers focus and arrange upon the screen the dashing spray and water washed rocks and catch the hurry of the elements in all their grandeur.

Subjects for marine photography abound. The pebbly beach overhung with soft fleecy clouds and the lazy, heavily laden coaster at anchor in the middle ground; the "stern and rock-bound coast"; the quiet harbor scenes and the more quiet wharfs, seen when the tide is low and the reflections long; the fisherman homeward bound with all sail set and filled with the summer breeze; now and then the fishing schooner may be caught on a windy day in fall with mainsail reefed throwing the spray from off her bows as she leans to the breeze and leaves a white tumble of foam along her sides and far astern.

There are two ways of taking marine negatives: the one by having a large stationary camera—say eight by ten—placed upon some advantageous point and furnished with a reliable finder, the other by means of a hand camera and afterward enlarging the more successful exposures; both ways have their advantages, but I think the larger per cent. of fine work will be done with the stationary camera of moderately large size as the better work is always done with the more painstaking care.

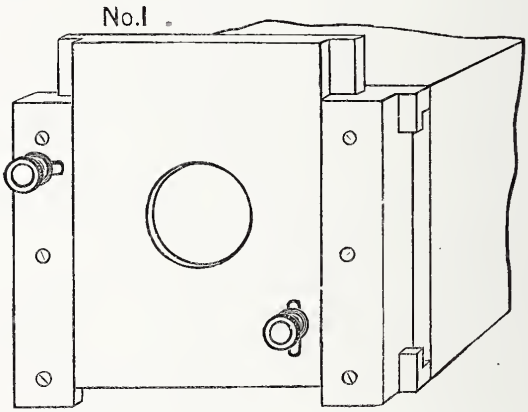
So then let us choose a reversible back, long focus, eight by ten camera and the best rapid rectilinear lens attainable with a focus to exceed the diagonal of the plate used, and a shutter that will admit a single flash of light through a moderately large opening which shall remain uniform in size throughout the exposure.

The finder, which is one of the most important adjuncts to good seaside work, is made as follows. Construct of light and thin wood a rectangular box open at both ends and four by five inches in cross section inside; its length is

immaterial so long as it be enough at the start, say fourteen or fifteen inches; do not fasten the sides of this box together, nor to its other parts, till all is finished and tested.

Now make for one end a double sliding front as shown in figure No. 1, and guard against its accidental movement by binding screws. A fine ground glass screen is to be placed in rebates inside after its correct position is found.

Next find the lens suitable for this finder and test its applicability to our wants; it is evident that the image seen upon the screen of the finder must exactly correspond to that upon the screen of the camera, and to secure this result



there must be a certain relation between the, say, fifteen-inch lens of our camera and the ten-inch base of our plate, and the finder lens and the base of the finder screen:

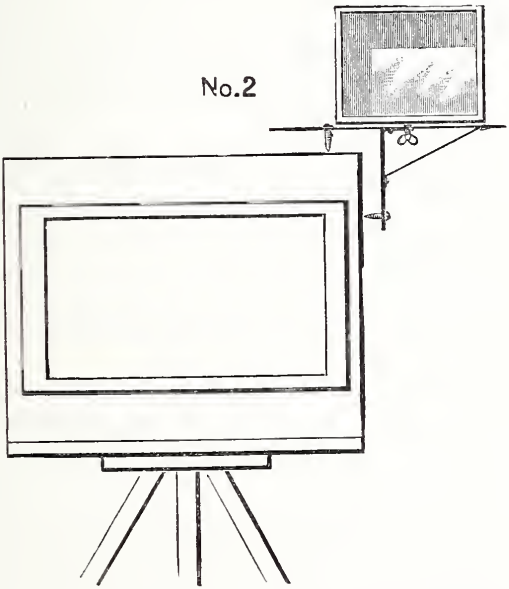
15 : 10 : : 7.5 : 5

therefore, our finder lens must be practically seven and one half inches equivalent focus if our larger lens is fifteen inches equivalent focus; if this cannot be obtained, suit the size of the box to that of the lens; any cheap form of lens will suffice if its aperture be of sufficient size to admit of a bright image.

Blacken the finder inside and out with drop black and turpentine; put it together loosely and find position of

ground glass when the lens is carefully focused upon some distant object and insert it firmly; cut off the box five or six inches behind the glass; next balance the finder upon a knife-edge and at the centre thus found place two light thumb-screw plates, one on the bottom and one on the side to allow for use of plate in upright position; fasten the box securely together.

To make the camera and finder of the utmost use to us we should provide both with some first-class make of lens,



the formula for which will allow of our unscrewing one combination, often the front one, and using the other for such marine work as does not require the greatest nicety in the matter of straight lines, and few marine views are particular in this respect; by this means our focus is about doubled and its depth and sharpness, all that is required for this variety of picture making.

This finder is fastened to the larger camera by means of a brass bracket and thumb screws, as in the cut, figure No. 2.

A vertical and a horizontal line which bisect each other at the centre should be drawn with pencil upon the focusing screen of both camera and finder; attach the finder firmly to the camera, and focus upon some conspicuous point, and by means of sliding front bring this point upon the point of bisection of the lines in both camera and finder; this being carefully done the field of view in each should be identical.

The focusing cloth, while carefully covering the camera during exposure, should be slipped under the finder by means of a small slit through which the brass bracket slips, the projecting hood over the glass enabling the image to be clearly visible while waiting for the moment of exposure.

In selecting subjects for marine views seek to reproduce some of the motion of the objects about you, unless, of course, you are picturing the quiet wharfs or the calm noonday reflections when repose in man and nature should be as carefully studied: the slightest particle of spray dashing over the rocks, the comb of an incoming wave, the white foam at the vessel's bow; anything, however trifling it may seem, provided it be of that variety of motion which belongs to the sea, will give to the picture that peculiar charm which lovers of the ocean will at once discern.

Motion, that is, the sense of motion correctly and spiritedly depicted, often makes the seascape a thing of beauty and one of which we seldom tire; a landscape should show nature at rest.

Marine negatives should always be full of pluck and brilliancy, and to secure this result err rather on the side of slight under-exposure if err we must; never over-expose, thinking to remedy the matter in development, for the result is flat and uninteresting in the extreme.

Develop with pyro always, and with pyro, too, for this work, that does not contain too much sulphite of soda, because the *slight* chocolate tinge left by the pyro on a properly developed plate ensures us that sparkle without which the marine view is a failure; for this reason, too, the plain hypo bath is the best; it should be used fresh, if need be, for every negative, and the plate well washed before fixing. The prints should never be over-toned, and I do think that for this work

the albumen positive often has the advantage over the colder toned bromide or platinotype—though bromides can readily be developed to exhibit a warm tone; blue prints if artistically made upon good rough drawing paper are superb for some kinds of sea views.

One thing more: Do not go to the shore for marines and expect to bring back all there are; take everything easily; use the greatest care and secure a few views of artistic merit, and try to improve upon them the next season.

In this way the taking of marine pictures may be made by far the pleasantest portion of the amateur's experience. So take the camera to the seaside, and with it placed in readiness upon the quiet wharf or the shelving water-washed rocks, we may take our summer's rest while the ear is ever conscious of

> "That strain of solemn music from the sea,
> As though the bright air trembled to disclose
> An ocean mystery."

PHOTOGRAPHY AND MEDICINE.

BY ANDREW PRINGLE.

OF all the services rendered by photography to humanity I doubt whether any are of more importance than those in the department of scientific medicine. Medicine is every day becoming more useful to mankind, because it is every day becoming more scientific; medical men are more and more going to the root of our ills; directing attention to causes rather than to symptoms; blind empiricism, depending chiefly on traditions, is surely dying, and the *rationale* and direct effects of treatment are being studied both in medicine and in surgery. Those outside the profession see these things more clearly than those within the pale. Experiment is, as we see, taking the place of guess-work. If now it can be shown that photography is an agent likely to assist in this scientific course, our case is fairly made out in favor of the use of photography by medical investigators and teachers.

Observation and experiment must run side by side, and in most cases the observations must be periodical and not isolated. If changes are taking place the more often these changes are noted the greater the value of the series of observations; if we have in our power a process that will record permanently, certainly, easily and speedily, the various stages of change, we have a process which no wise and earnest investigator will neglect. In photography we have such a process.

For inter-communication of knowledge, as from teacher to taught, photography has no rival as a graphic process. Apart from the fact that it is an automatic procedure, free from the disadvantages of pre-judgment and personal equation, it places us in a position to transmit precise information from one teacher to many students. I have seen the procedure in a physiological class, for example: A large number of microscopical sections cut from some tissue; a miscellaneous lot of these sections mounted and placed under a series of microscopes; no two sections precisely alike, the critical points absent from some of the preparations, and possibly no three students directing their attention to precisely the same points. The lecturer discoursing on one point, the students in utter doubt as to what point he is discussing, and eonsequently attending to no point at all. How much more satisfactory to project on a good-sized screen a good slide of the preparation, the lecturer specifying with finger or pointer the cell or characteristic under discussion. I have seen both these methods of teaching, and I know very well which is the better.

But I will go further, and dwell on the fact that many microscopical facts are so difficult to demonstrate, that much time must be spent before a preparation is obtained show-the important point at all. I wonder how many sections I have cut in the hope of showing well Corti's organ in the ear, "taste-cells" in the tongue, organisms in dental tubules, mitoses, the relation of bacteria to cells, and a host of other difficult subjects. By the use of photography one successful preparation is made to serve the purpose, permanently, of a hundred used in the ordinary way and entailing who

knows many days of labor with only makeshift successes at the best in many cases. And again, how many objects are there that are at all times extremely rare. If a teacher could at any time find *filariae sanguinis*, or human actinomyces, or *spirillum Obermeyeri*, or even if he could make *permanent* preparations of rare objects at will, then he might be more independent of photography, but as things are he must see the advantage of making a photograph of such objects when he is lucky enough to obtain them.

A considerable number of medical men within my circle of acquaintance have adopted photography as their regular method of registering the course of disease or treatment; in this way large albums are being formed at various hospitals, and it need not be said that these albums must prove both interesting and valuable. We can trace the result of operation or medication; we can compare the state of the patient before and after operation; we get a permanent record of malformations, new growths, distribution of skin diseases, and other similar facts, and this we get by a process requiring no special training, no art education, no great amount of time, and no heavy expense. And these illustrations we can use in lectures to students, showing them both the gross appearances and the microscopical characters of the abnormalities. It is now many years since I was struck by the value of certain illustrations in Charcot's famous book on "Hystero-epilespy," and this has been followed by others of the same kind, notably an "Atlas of Skin Diseases," by Dr. Piffard, of New York; "La Photographie Medicale," by Mons. A. Londe, and many others. I think it better not to allow myself here to enter into details, as probably my type-writer would run away with me, and lead me into excesses of literature not adapted to this place; the most that I can hope to do is to call renewed attention to this most valuable branch of photographic utility. I believe that considerable attention is being given to photography in America, and I know that in this country the adoption of photography in any medical school is a sure sign that that school is enterprising and means to keep up with the times.

PHOTOGRAPHY IN THE ULTRA-VIOLET.

BY ROMYN HITCHCOCK.

AMONG the most remarkable and interesting results of purely scientific research in the realm of photography during the last few years, those of Victor Schumann stand pre-eminent. Working quietly and alone in his well-equipped laboratory in Leipzic, he has succeeded in opening a new field of investigation in the ultra-violet region of the spectrum. To accomplish these results he has been obliged to devise, not only new methods and new apparatus of the finest design and workmanship, but also new processes of photographic manipulation, and the sharpness of definition which he has obtained by the use of plates prepared by the process devised by him, for the photography of invisible radiations, is superior to that of any photographic process hitherto known, with the possible exception of the Daguerreotype plate.

It may be of interest to briefly review what he has accomplished in the extension of our knowledge of the spectrum. In the year 1842, Becquerel first carefully observed the existence of invisible radiations beyond the violet of the solar spectrum, using Daguerreotype plates. His observations extended to the region now designated by the Frauenhofer line P. About ten years later, Stokes, in his famous studies of the transparency of quartz, found that there was an invisible solar spectrum which, measured from the line H, extended to almost twice the length of the visible spectrum; but when he came to use the light of an electric spark and examine the invisible portion of the spectrum extending beyond the violet by means of a fluorescent medium, he found that there were invisible radiations covering a space six or eight times the length of the visible spectrum. The most refrangible radiations observed by him were obtained from the light of an electric spark passing between poles of aluminum. These have a wave-length of 186 to 185.2 micro-millimeters. This is the extreme limit of fluorescence which can be distinctly observed.

Cornu was the first to succeed in photographing the extremely refrangible rays. This he did by the use of collodion plates washed with water before exposure. He found that the absorptive action of the nitrate of silver solution upon these rays was so great as to make it impossible to photograph them. The practical limit of photography with collodion plates is about the cadium line 214.41, but the difficulties involved in investigating this region of the spectrum are so great that it remained almost unknown until the subject was taken up by Schumann. Even the introduction of gelatine plates, which possess certain advantages over the old collodion plates, did not, of itself, add anything to our knowledge of this extreme region of the spectrum.

Schumann, however, soon after he began these investigations, found that there was a comparatively long extension of the invisible spectrum beyond the aluminum line 185.2. He was soon led to the very important observation that all the extremely refrangible rays were unable to pass through even a very short column of air without suffering absorption. He therefore constructed a spectrograph, from which the air could be very perfectly exhausted. This ingenious apparatus led to very surprising results, but he soon found that there were other causes of absorption which were too important to be neglected. Glass optical apparatus was early discarded, prisms and lenses of quartz were substituted, and for the most refrangible rays even quartz is not sufficiently transparent, and fluor-spar is the only medium that can be used. It was also found that the gelatine on the plates acted so powerfully in absorbing these rays that a new process of preparing plates must be devised before it would be possible to carry on the investigations to the extreme limit desired. This was a very serious obstacle to overcome, but Mr. Schumann has succeeded in preparing a plate without gelatine, consisting of pure silver bromide spread in a thin film upon glass. Plates thus prepared give very intense and sharp pictures of the extreme refrangible rays of the spectrum, and they have the additional advantage of being insensitive to ordinary light.

By the use of the latest form of apparatus, Schumann

has succeeded in photographing in a vacuum, with quartz prisms and lenses, or with a diffraction speculum with gelatine plates, lines representing a wave-length of only 182 micro-millimeters; but the absorptive action of gelatine becomes very great for all rays beyond 277 micro-millimeters. In the same apparatus, by the use of plates prepared with pure silver bromide, the photographic spectrum is greatly extended; but only when flour-spar is used for the optical parts is it possible to photograph the most refrangible rays that have yet been discovered, corresponding to a wave-length of about 100 micro-millimeters. The next work of Schumann will be to accurately measure the wave-lengths of these very refrangible radiations.

The absorptive power of air upon these rays is very great. At ordinary pressure, a thickness of air of only one micro-millimeter seems to effectually extinguish waves beyond 170 micro-millimeters.

The new plates are developed with pyrogallol and soda. The operation is completed in one or two minutes. The fixing is in the usual manner. A remarkable fact is observed concerning the effect of different degrees of granularity in the coating upon the sharpness of the image. Contrary to the natural expectation, the sharpest division of the fine lines is obtained with the coarser grained plates. So sharply are the lines defined that, with a magnification of 100 times, they can still be accurately measured, and after an enlargement of 325 diameters they still appear sharp to the unaided eye. In some cases, groups of lines enlarged 30 diameters are still unobserved by the eye alone.

The remarkable sharpness exemplified by the lines of Schumann's plates, suggests the possibility of great improvement in the future manufacture of plates for general use.

The surprising sensitiveness of pure bromide of silver to vary refrangible rays also indicates the strongly actinic character of radiant energy, the existence of which has hitherto remained unknown.

The far-reaching importance of these researches is revealed when we consider their application in the study of the spectra of the elements, especially with reference to the peri-

odic law, or the laws of elemental genesis. The lines and groups of lines and bands which cross the spectrum from the invisible red which has been explored with the bolometer, and the comparatively short color portion which has been most carefully studied and mapped and continue on to the extreme limit of Schumann's observations, are leading us, for their interpretation, into a new and higher chemistry. They are opening to us a chemistry which deals with analytical processes, not such as we may carry on in beakers and test-tubes, but which, through the medium of the electric spark, the bolometer, the spectroscope, and the photo-spectrograph deals with the analysis of the vibrations and combinations and groupings of atoms—with the atomic constitution of matter.

Hitherto our range of spectrographic study has been too limited, but now, with the addition of the sharply defined groups of lines on Schumann's plates, ending with the line of that one element, hydrogen, which is represented throughout the whole range of the spectrum from extreme red to wave-length of about 100, we may expect wonderful advances in our knowledge of elementary chemistry and physics.

ON THE KEEPING QUALITIES OF GELATINE DRY PLATES.

BY PROF. H. W. VOGEL.

EVER since dry plates, I mean gelatine emulsion plates, have been introduced, various reports on their keeping quality or durability have been made. Mr. Wight, an Englishman, has stated that these plates will keep intact for three years, and in direct contradiction to his assertion we sometimes find plates showing decomposition margins three weeks after having been coated.

Orthochromatic, eoside of silver plates, it is generally reported, are not as durable as ordinary emulsion plates, but even that has been contradicted, for example, by Professor Tschirch, of Berne, who took eoside of silver plates on his Java expedition; they were subjected to all kinds of climatic

influences, brought home to Berlin, and two years after exposure were successfully developed. Lieut. Werther, of the royal Prussian army, had the same experience. He took the same plates way down to the Tanganika Lake in the interior of Africa, and Prof. Kayser, of Hanover, has used eoside of silver plates quite successfully after they were two and a half years old.

My opinion on the durability of plates has often been asked, and I have answered: "Fresh fish is the best fish," which is the exact truth in regard to gelatine plates.

Wolff says: The sensitiveness of a dry plate will increase up to a certain time, then stops and decreases afterward.

There is not the remotest doubt, highly sensitive plates will not keep for a very long time. An experienced photographer, an officer of the imperial navy, limits the keeping properties of them to within six weeks. Emulsions subjected to ammonia treatment are less durable than those made sensitive by boiling. Bathing a plate in ammonia increases the sensitiveness very much, but spoils it for practical purposes within a week or two.

A most important factor to promote the durability of a gelatine emulsion plate is the gelatine itself. Not long ago a well-known manufacturer of gelatine submitted to me fourteen samples of the article to be tried in regard to their photographic qualities. I first applied the test described by me many years ago, mixing the gelatine solution of 10 per cent. with the same volume of silver nitrate solution 1 : 10 and added ammonia to redissolve the precipitate before heating.

Every one of the samples turned yellow and brown respectively, showing distinctly their unfitness for emulsion making. Gelatine turning brown by the treatment with ammoniacal silver produces heavily fogged plates, and that assuming but a yellow color may possibly give clear plates, but they will not keep for any length of time.

Plates made by the same manufacturer differ very often in their keeping qualities, and the question is: has the gelatine used been preliminarily tested arises? We very much fear the answer would, in most instances, be in the negative. In a

large manufactory of plates, no gelatine should be used for emulsion making without previous test. In my experiments on a small scale I never neglect doing so.

It cannot be denied gelatine manufacturers have made much progress during the last years, but will not differences in the rough material used result in differences of the manufactured article?

Years ago I used to wash every sample of gelatine presented to me in eight and more changes of water, and produced by this simple method good results.

An extensive manufactory had followed my method for several years, but the plates made were not remarkable for durability.

It should never be forgotten, a sensitive film of any kind offers a comparatively very large surface to the action of air and moisture. About ten years ago, plates to be developed in pure water only were offered to the trade and attracted general attention. These plates were coated with hydrochinon and soda on the glass side; but the developing medium decomposed in a very short time, and we have never heard of them since.

Other sensitive surfaces behave differently. If we suppose the durability of a plate depends principally upon its sensitiveness, the old dry collodion plates, from 40 to 80 times less sensitive than a gelatine emulsion plate, should be the more durable. But that is by no means so. These plates were all prepared with a sensitizer or organifier, with morphia, tannin, gallic acid and other things, all of which became oxidized in course of time and made the plate worthless.

Dr. Eder has stated, collodion has an oxidizing action upon the plate, while gelatine is a good reducer and sensitizer.

Bromide of silver separated from gelatine emulsion by centrifugal force, and re-emulsified with collodion, gives a preparation three times less sensitive than the original gelatine emulsion.

An air-tight packing to plates probably contributes more to the durability of plates than anything else.

CHROMO-PRINTING BY HELIOGRAVURE.

BY COLONEL J. WATERHOUSE, I.S.C., ASSISTANT SURVEYOR GENERAL OF INDIA.

CHROMO-PRINTING by heliogravure is, of course, nothing new. The beautiful and artistic productions of Messrs. Goupil & Co., in this manner have been on the market for many years, and some of our English photo-engravers, notably Mr. Alfred Dawson, have produced similar work. As a rule, I believe that in these cases the printing is done by one impression, the plates being inked by hand with the different eolors required, so that the difficulties connected with "register" in printing from several different plates are avoided. If the printing paper is used wet, as is usually the case in copper plate printing, true register is just as impossible as in chromo-litho printing on damped paper, while if the paper be used dry it requires enormous pressure to make the paper pick up the ink properly and give perfect impressions.

A trial recently made in the photo and litho office, Calcutta, with the assistance of the photo-engraver, Mr. A. W. Turner, has shown that impressions in three colors, for instance, a map with outline in black, hills in brown and water in blue, can be easily produced with very perfect register by cold printing with little or no extra pressure.

The method of preparing the three copper printing plates is as follows: The original map containing only the outline and names is copied and etched in the ordinary way on copper plate by itself, and then from the same transparency as was used for this plate a second tint plate representing the water is produced, this is done by masking out on the first transparency with Indian ink, all the parts of the water, except smaller rivers represented by lines. The outline is then scraped off with a penknife or scraper, thus leaving the land part of the map transparent glass and the water opaque; from this transparency the blue plate for the water is etched. The third plate for the hill shading to be printed in brown ink, is produeed as follows: A dry print on tissue paper,

taken from the outline plate is attached to the smooth side of a plate of ground glass and the hill shading is then drawn in a reversed style with a black chalk (cretation) pencil on the rougher side, a retouching desk being used; from this drawing the hill shading is etched direct, the drawing in part taking the place of a transparency. The three plates are printed in black, blue and brown on the art paper now so commonly used for fine impressions from half-tone photo blocks, used dry, and registered as in chromo-lithography with needle points.

This method seems very applicable to printing in so-called natural colors from three plates produced from three negatives taken as proposed by Ducos du Hauron, Ives, Albert and others with the use of appropriate dyes for the sensitive surface and color filters. The copper heliogravure plates are so much more easily printed than collotype plates, stand more work, can easily be corrected and touched up and lend themselves to the more perfect reproduction of delicate color tints. The results while perhaps not equal to those obtained by the single inking process should certainly be far more artistic than the color blocks now so much used.

The art paper used dry picks the ink up well and takes a good impression of delicate tints.

STEREOSCOPIC VIEWS.

BY EMIL DE NEUF.

UNDER the above title the writer contributed a paper to last year's ANNUAL, to which he would like to add the following lines, giving his experiences during the past year's work.

One of the chief difficulties presenting itself in making a stereoscopic view is the circumstance that only a portion of the view as shown in the camera can be utilized for the picture; and it is a difficult matter to correctly judge the ultimate appearance of the finished print from the image on the ground glass. To overcome this obstacle I have adopted the following dodge:

A thin black or ruby piece of paper is cut so as to exactly fit in the rebate of the camera back, and this paper is made into a mask, as shown in Fig. 1. The distance between the centres of the openings must be the exact distance between the centres of the two lenses; the openings themselves are made 2⅞ inches wide. As the height of the picture depends entirely on the size of mount to be used it must be regulated accordingly. The mask should be fastened into the rebate on the upper corners only, so that it will not obstruct access to the bellows room for insertion of the partition. In the openings or cut-outs of the mask the view is seen on the ground glass as it will appear in the print, and it is now an easy matter to arrange the same. In doing this special care must be taken to have the base line of the ground glass absolutely horizontal, so that the corresponding objects in both halves will be on the same level. In exposing it is always best to use as small a stop as possible, and to have every part of the view in sharp focus. The apparent flatness and lack of atmosphere will of course be overcome in the stereoscope.

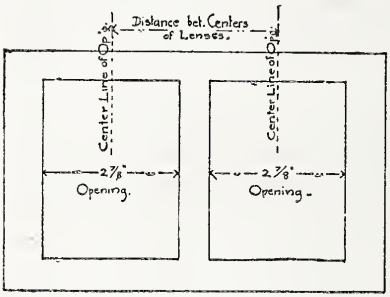


Fig. 1.

In development the margins, having been covered by the mat, will remain clear, leaving the views with well-defined outlines. If it is desired to reverse the negatives and print both halves on one piece of paper it is only necessary to cut the plate in two through the centre margin; then cut off the outside margins and butt the two halves together at these lines. The negatives may be mounted on a plain glass and matted to cover up the joint and edges. The

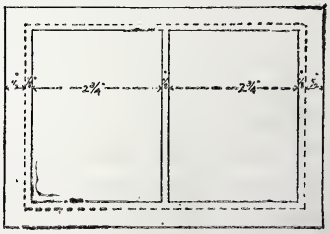


Fig. 2.

PHOTO BY W. B. POST

SUNSHINE AFTER RAIN.

Steam Press Gelatine Print,
The F. Gutekunst Co.,
Philadelphia.

mats can be cut out of black or ruby paper, as shown in Fig. 2, and may be pasted on the negative. The dotted lines shown in the mat may be drawn on in pencil and will serve as a guide for placing the paper, which should be trimmed to the right size before printing.

THE "NAVER"; OR, THE CONSECRATION OF A PARSEE PRIEST.

BY SHAPOOR N. BHEDWAR.

"He alone can conceive and compose who sees the whole at once before him."

RUSKIN has defined four ways in which beings supernatural may be conceived as manifesting themselves to human sense. The first by external types or signs or influences and lastly by their operation on the human form which they influence or inspire. In every case where the external form is conceived it is the form of some creature quite familiar to us. We can conceive no form peculiar to spirit, and it cannot be independent of any preconceived notion of a material object. The way to obtain supernatural character is by retaining the actual and real form in its full and material presence, and "without any aid from external interpretation whatsoever to raise it by mere inherent and intrinsic dignity to such pitch of power and impressiveness as cannot but assert and stamp it for superhuman." The feeling of impressiveness is clearly revealed by the awe-inspiring attitude of the priest in the first picture of this series. The same vein of impressiveness runs through the whole set, and stamps on the mind of the beholder the feelings of religiousness and reverence. In order, therefore, to judge these pictures they should be approached as much as possible in the artist's own mood and seen from his own point of view. They do not miss of the angel, and the artist has well succeeded photographically, so far as the limits of the art could permit, to invest them with all the sense of religiousness which their very first sight inspires. Had not the artist been moved by intense faith and deep feeling the task would not have been accomplished.

By Shapoor N. Bhedwar.

THE NAVER—I. INVOCATION.

The following is a detailed account of the set: The son of a Zoroastrian priest or "Mobed" becomes an "Ervad" or duly consecrated priest on his undergoing what is called the "Naver" ceremony.

The young novice is first of all taught to recite properly all the "Avesta" (sacred writings) texts. To purify the body he undergoes the "Bareshnum," or the sacred ablution ceremony, when he is kept apart and passes through a course of discipline for nine days, typical of the nine months of the gestation period. On the tenth day he is made to bathe, and for six days more he remains in a clean quiet place, reciting regularly his prayers during the different portions of the day.

By Shapoor N. Bhedwar.

THE NAVER—II. FIRST ABLUTION.

During these six days two priests daily perform the "Yacna" ceremony (Picture No. 4). On the last day the novice, after the second ablution, is made to put on new clothes, and is carried to the fire temple, along with a large concourse of priests and laymen. Under the guidance of the attendant priest he is made properly to perform several ceremonies. On four succeeding days he officiates at different ceremonies, and afterward returns home a full-blown priest.

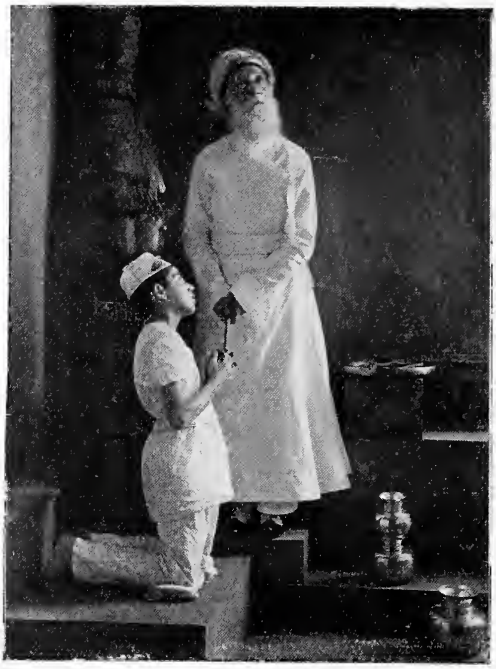
The priest in ancient times was one who had gone through a strict course of discipline, which helped not only to subjugate his animal desires, but at the same time to evolve his

higher nature. The perfect priest became a centre of moral and spiritual energy.

The "Naver" ceremony is a relic of such archaic diciplinary initiation, although at the present day more importance is given merely to the outward forms than to the inward purification and training.

The tale of the set is as follows:

No. 1. "The Invocation." After the initiate has been first made to enter the sacred precincts of the fire-temple for the Naver ceremonies, which last for thirty days, the head priest is made to invoke the aid and blessings of the Almighty on the arduous work of the would-be priest. The venerable-looking priest stands confessed in all the soul-stirring and fervent prayers of a devout heart, who is preparing, like himself, to lead a young Zoroastrian into the secrets of his own religion. "To the Zoroastrian, prayer assumes the form of a recognition of all that is pure, sublime and beautiful in the surrounding universe. He can never want opportunities of paying homage to the good Spirit and of looking into the abysses of the unknown with reverence and wonder."



By Shapoor N. Bhedwar.

THE NAVER—III. INITIATION.

No. 2. "The First Ablution."—This gives an idea of the

"Bareshnum" or the sacred ablution which is the first step in the Naver ceremony. The candidate has to undergo two retreats of ten days each, which he is required to pass in prayers and pious meditation. Before going through these periods of retreats in the fire-temple it is incumbent on him to go through certain ablutions to purify the body. These purifications are, in their turn, intended to act upon the mind of the candidate, and to lead him to think about the ways and means of purifying the mind. This picture is meant to give an idea of one of these ablutions.

By Shapoor N. Bhedwar.

THE NAVER—IV. FINAL ORDERS.

No. 3. "The Initiation."—This represents the head-priest expounding to the initiate all the rites and doctrines, the secrets and philosophy of his excellent religion—"a religion simple and sublime, to which the best modern thought is fast approximating"—and exhorts him "to recognize and adore the Master of all that is good, the Principle of all righteousness, 'Ormuzd,' and with purity of thought, of word, and of action, a purity which is marked and preserved by purity of body." The fundamental dogma of this religion comprises a statement that there is one supreme unknown First Cause, who manifests himself in the universe under fixed laws which involve the principle of polarity. We cannot shake off this principle of polarity and arrive at any knowledge or even conception

of the absolute in regard to the atoms, energies and natural laws which make up the universe of matter and of all the ordinary materials and functions of life."

No. 4. "The Final Orders."—This represents the last stage of the ceremony, when the young student is made to officiate as priest capable of going through the invocation to the spiritual powers and performing all the religious ceremonies. Three metallic goblets and a metal basin lie before him indicative of the lower principles in man. The fifth "Havnim" or mortar wherein the sacred Haoma plant is pounded to be afterward strained and drunk is symbolical of the lower desires in man and taking thereout the efflorescence of the best human aspirations, which become assimilated with the Higher Mind. While the initiate is performing the ceremony, he steadily fixes his gaze at the sacred blazing fire representative of the Divine Flame which is to be awakened by each one of us within ourselves. "The sacred fire is distinctly understood to be merely a symbol of the Deity, and is used to bring more vividly before the minds of the worshipers the idea of the spirit soaring up toward Heaven." The priest, standing by and assisting at the ceremony, represents the silent watcher

By Shapoor N. Bhedwar.

THE NAVER—V. FULL-BLOWN PRIEST.

within that guides and elevates us. From the commencement to the end of the ceremony the left hand of the initiate rests on two peculiar stands called "Maharoo," or "the crescent-shaped," which signify the dual aspect of the mind, and serve to point to "the all-pervading principle of polarity in nature, for every existence implies polarity, and therefore there could be no good without corresponding evil."

No. 5. "The Full-blown Priest."—Here the candidate is now fully initiated and qualified to approach the most sacred altar in the fire-temple and perform the ceremony called "booi-dádan," of feeding the sacred fire with sandal wood and frankincense, but not until he has gone through the other ceremony of the higher order called "Mertab," which is in many respects similar but more intricate and difficult to perform.

N. B.—The "padán," or a kind of mouth-veil, is a small and nearly square piece of white linen tied in front of the face, and is simply intended to prevent the saliva from the mouth defiling the sacred fire and other objects placed before the priest.

By O. von Bargen.

SUNSET AFTER THE STORM.

By W. K. L. Dickson.

PHOTOGRAPHY EXTRAORDINARY.

BALLOON PHOTOGRAPHY.

BY W. N. JENNINGS.

By W. N. Jennings.

TO make good photographs from a balloon three things, at least, are essential:

First, a balloon, properly constructed, so as not to swing or revolve in mid-air.

Second, an aeronaut who knows his business, and understands the limits of the lens, managing the air-ship accordingly.

Third, a nerveless, cold-blooded photographer, who is not liable to lose his head among the clouds.

With such a combination, backed up with a good photographic outfit and clear weather, pictures may be obtained which will not simply be of interest, but of extreme value in many cases.

Prof. Samuel A. King, the veteran aeronaut, who has made almost 500 ascensions, succeeded in 1861 in making wet plate views from a captive balloon of a section of Boston, and a set of fine cloud pictures from a free balloon on the same day.

"If I could only give people an idea how a great city like Philadelphia looks, while viewed from the clouds, I am sure I should take up passengers every fine day, and balloon voyages would become very popular. I should think the camera ought to be able to help me out, but I have taken over a dozen photographers with me, who have never produced the results they promised." When Prof. King talked that way I determined to attempt the feat, for my camera has had an eventful career: followed in the wake of the Johnstown flood; stepped on the heels of the Louisville cyclone; rushed through a Dakota tornado; been chased out of a Joss house in San Francisco; nearly slipped from the

ledge of Glacier Point, in the Yosemite; was badly blistered by the hot breath of a geyser in the Yellowstone; besides having many narrow escapes from contact with stray thunderbolts. So the camera was ripe for a balloon trip, and got it.

The day was perfect. A previous thunderstorm had cleared the atmosphere to a remarkable extent. The balloon rose quickly; the earth dropped suddenly, and the rest was all a dream (not a nightmare, as I had expected). The "Eagle Eyrie" seemed to stand still, and the city of Philadelphia slowly swept under us. Not wishing to produce map-like photographs, a hole was not cut in the bottom of the car, and the lens allowed to take a vertical view of things; but the camera was held in the hand and its glass eye turned in the same direction as our own, picking out any point of interest desired. Just before I shot the shutter, King asked the other two passengers to keep perfectly still and hold their breath until the exposure was made. To this cause I attribute the hair-line sharpness of the thirty-eight negatives which were obtained during the two-hour trip in cloudland.

A high-speed shutter, small stop, long focus lens, quick plate and slow development also had something to do with the final outcome.

The view illustrating this article was taken at a point about a mile and one-half high, while passing over Girard College, Philadelphia. The height will be appreciated when you look for people in the street, and only discover here and there a white dot—the roof of a street car.

By W. N. Jennings.

PHILADELPHIA FROM A BALLOON.

Copyright. By W. N. Jennings

BALLOON VIEW OF GIRARD COLLEGE, PHILADELPHIA.

100° IN THE SHADE.

BY P. C. ANDREWS.

By Jesse Poundstone.

SHADE, forsooth! as if any spot on this earth at that temperature could be called the shade, and there was I sitting in a bath of perspiration and thinking of the plates I had exposed and when it was ever likely that they would be turned into negatives. Only a day or two ago I developed a number of plates. By the aid of a few pounds of ice I managed to keep the films intact, gave them the final washing and placed in the rack to dry. They were particularly good ones, some of the best I had ever made, and I could not help thinking of them as I lay in bed that night, and was anxious to get to work next day making prints from them. I arose early, and went to examine them once more, only to find a few plates of almost clear glass standing in the rack, and a black-looking deposit on the shelf, which constituted my work of the previous day.

But I am a wiser man now. I have tried everything that has been recommended for hardening, with the result that I invariably use the Woodbury Antipyr. I tried the formalin which has been so much extoled, and found the only drawback to lie in the ability of this substance to reduce the image very considerably.

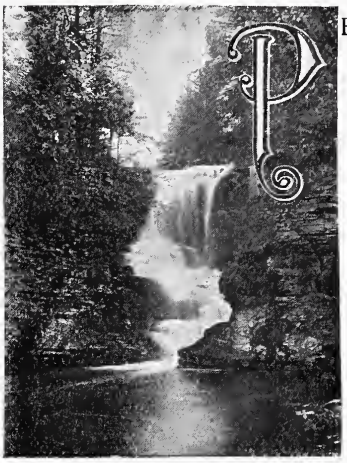
Woodbury Antipyr appears to me to possess, as its principal ingredient, formaldehyd, or formalin, as it is more commonly called, but there is evidently some other agent added which effectively prevents reduction. Certain it is that this is, without doubt, the finest medium of hardening negatives or gelatine prints that has yet been put upon the market.

Miss Annie Irish. By Morrison, Chicago.

A STUDIO STUDY.

EXPRESSION IN LANDSCAPE.

BY H. P. ROBINSON.



By H. Y. Pos.

PHOTOGRAPHY has been struggling for fifty years to faithfully represent the stocks and stones of this world, and has succeeded to perfection, but its productions have, unfortunately, been nearly always of stocks and stones, and glimpses of the spirit of nature have been all too rare. Our art has shown the fallacy of the old notion that close imitation of nature without other qualities was art, for no means of imitation has ever followed nature so closely—so abjectly—and, perhaps, no representation of nature is further from art than the ordinary photograph as usually manufactured. Maps, plans, diagrams of nature, have been and are plentiful, but anything beyond has been as scarce as photographs were originally curious, and when they ceased to interest as curiosities, photographs had very little left in them to satisfy the hunger of those who look for more in an artistic meal than dry bones. And yet ample means of art are in the material.

I do not deny that a few of our craft have always struggled to forward photography as an art, for by doing so I should deny myself; but, now-a-days, it requires something more than earnest individual effort to call effective attention to any matter whatsoever. If an angel came down from heaven it would be necessary to advertise him. In the case of art photography something less ethereal and more in the nature of a revolution, or an earthquake, came to the rescue. This happened five or six years ago, when Dr. P. H. Emerson published his "Naturalistic Photography." This remarkable book—not only the teaching but the robust lan-

See article. "Expression in Landscape." By H. P. Robinson.

STORM CLEARING OFF.

guage, the excess of energy of which was induced possibly by extreme sincerity—was strongly opposed, by no one, perhaps, more vehemently than by myself. The author's hard words broke no bones, and he shortly withdrew the book from publication; for Dr. Emerson is one of those very rare brave men who have the courage to be honest, and not ashamed to frankly withdraw as altered opinions dictate.

But the upheaval was of infinite value to the progress of the art, if not exactly in the way the author intended. During the controversy I wrote as follows, according to opinions I have always held: "Good fruit sometimes comes from the rankest soil; out of everything good may be extracted; and out of 'naturalistic photography' may come a reaction against that excessive sharpness of focus, which is still dear to the amateur and professional alike, and against which photographers who practice art have always protested."

This has happened, and more has followed. The animated discussion is to a great extent answerable for the much greater attention that is now paid to photography as an art all over the world; the art is placed on a firmer, broader and more catholic basis; and the "New Movement" in the art promoted by the organizers of *The Photographic Salon* is perhaps a far-off effect of the artistic disruption of a few years ago. And I think I may truly add that out of the preaching of many dogmas has come universal freedom. The sharpest photograph, so that it shows artistic feeling, is as welcome as any other variety of the fruit of the camera.

However that may be, I think it must be apparent that the *Salon* is setting a higher standard than has been found general hitherto. If I may so put it, the *Salon* has set up mental over mechanical photography, and the organizers are succeeding in their endeavor to encourage "only that class of work in pictorial photography in which there is distinct evidence of personal artistic feeling and execution." In future the mere bare facts of a scene will not be sufficient—there must be expression.

For even the most ordinary scene has its characteristic expression. Like the latest class of lady sitters who have

"souls in their eyes and laughter on their lips," it has expression, but unlike the latest fashionable profile with eye upturned and lips wreathed in a smile—two different expressions at once—the expression is its own. This latest pose in portraiture, in which the lady looks intellectual or spiritual for all she is worth with the upper half of her face, and simpers with the lower, is not the expression of nature, but the imitation by photographers of some portrait that was possibly a success, but becomes ridiculous when often repeated. Perhaps it is the long-hoped-for "new style."

Landscape expression varies in form and intensity with the hours. The freshness of spring, the heat of summer, the gold of autumn and the cold of winter are phases of nature which we should not only be able to see and feel in ourselves, but also to represent in our pictures. There are other and perhaps more subtle aspects of nature which are always before us: the coolness and freshness of morning, the heat and grayness of noon, and the mists and glow of evening, are well within the powers of representation of the photographer who can feel the beauty of the effect, and knows how to take advantage of all the resources of his art. The evanescent beauty of sea and sky, sunshine, fog, storm, calm, are all possible, given the mental quality in the photographer to know beauty when he sees it, and what will make a picture.

The other special qualifications necessary to represent these effects come naturally to those who know the ordinary technique of the art and have *not* confused their minds with the intricate chemistry which some think essential—and, indeed, to many, it remains the only essential, for this is where their progress ends!

In photography, as a rule, the hand has been educated at the expense of the head; the knowledge of how to make the materials has become stupendous and vast, and there it all stops—a mechanical art. The student who wants to go beyond this must cultivate the emotions; he must get into closer touch with nature; he must be able to grasp the scene in his mind and feel its beauty, as well as capture it in his camera.

I am afraid that what I have said would come under the head of vague talk if I did not give some illustration of what is meant by expression in landscape. Failing to obtain a suitable picture by another photographer, although many exist, I am constrained to give one of my own, and I diffidently offer one which I think, however feebly, presents what I mean by expression. It is not a chance snap-shot, but was produced by deliberate intention. The initial idea was the contrast between sunshine and storm, and the effect of rain.

Neither the painter nor the photographer can hope to find the effect he wants without trouble, and I had to wait, but the effect came in time and I secured it.

I am not going to destroy what little poetry there may be in the picture by explaining the details of production, or by leading off the student's mind into the laboratory; the illustration will answer my purpose if it shows what can be done, but I don't mind saying that happy chance had very little to do with this picture, but it was lucky that I found sheep within marching distance of the spot. During a heavy storm sheep pack together for mutual protection, and when the storm is over they gradually disperse to feed; whether they did this of their own notion on this occasion, or by the help of clever dogs, is of no consequence, so that the effect is obtained and it is true, and if the effect of the rain on the teeming earth has been *helped* by purely photographic means, what is that to any body so that the result is due to close observation of nature? Photography has been authoritatively defined as "painting by light," and what the spectator has to consider is, first, the pictorial effect of the picture, and, in the next place, the truth of the effect. If he does not like it he has a right to object and pass on; but to object rightly and to publish his opinion, he should consider whether he is qualified to give an opinion. He will, undoubtedly, decide in the affirmative, for every body thinks himself qualified to "deliver judgment on the encyclopædia."

I could give other examples, but hope I have said enough to induce those photographers who have any enthusiasm for their art to turn their energies for a time toward the reproduction of *effects*, *not scenes*.

AMIDOL.

BY A. R. DRESSER.

THERE is no doubt in my mind that amidol is the finest and most perfect developer that has so far been discovered, and has certainly given the death-blow to pyro. We have heard for some time that pyro would never be cut out, but it is certainly on its last legs, as amidol does its work better in all points, and is clean and certain in its results.

The great advantage of amidol is that it does for any kind of development, viz., plates (negatives), bromide papers or lantern slides, and one gets good and perfect results with any of them. Of course, it is necessary to learn how to use amidol properly before one gets good results. As to those who expect a developer that is ready mixed that will give good results on any plate or paper with any exposure, they will be badly disappointed, as that developer is not found yet and never will be, but after a short experience with amidol one is certain of good results if the exposure has been anything like near the point. One point to be remembered is that one can, with care and knowledge, get good results if the plate has been well exposed, and even if it has been four or five times over-exposed, but cannot get good results if it has been badly under-exposed, as one cannot develop on a plate what is not there.

There is no developer that has taken so quickly as amidol, as now all plate and film makers give the formula for amidol in their directions.

There is a difference of opinion as to which is the best way of mixing the developer, as many well-known workers give different ways of so doing, but if doctors disagree it is not surprising that photographers do.

For traveling, I always use the developer in the small glass tubes (according to directions) as sent out by the makers, but for home use I use the amidol *dry*.

I work as follows: I mix up a solution of saturated solution of sulphite, say 30 to 90 ounces, but I mix a gallon at

once and keep in a large air-tight jar with a glass tap to draw off at will, also a bottle of 10 per cent. bromide, for use for negative work and bromide paper. I take

Sat. sol. sulphite	6 ounces
Water	4 ounces
Amidol (dry)	1 drachm
10 per cent. bromide	50 drops

This formula is very good for bromide paper and negatives when the negatives have had a short exposure, but if the negatives are over-exposed one must use a little more water, say 2 ounces and 2 to 10 drops of 10 per cent. bromide (per ounce of developer) according to how much the negative has been over-exposed.

For bromide paper I recommend the developer to be one full strength as one will then get good black tones; if developer is used weaker for bromide paper one gets a gray color.

For negative work it is best to mix up three strengths of the developer:

1. Formula as given, diluted with water, say 2 ounces of developer as given, and 1 ounce water.
2. Same, only 10 drops of 10 per cent. bromide added.
3. Formula as given, full strength.

One can then begin with the restrained developer (No. 2) if he thinks negative is over-exposed and when detail is out; if he wants density, go on with No. 1 or 3, but all this must be learned by experience. If a thin negative is required full of detail and soft, develop with formula No. 1 till the image appears and then pour on water and watch; the negative will go on developing in the water for four or five minutes, then pour on developer again for a minute and again put in water, using first one and then the other till negative is as dense as is required.

Now I trust these few words will give an idea of how to start development, and just how to work must be learned by experience and trials; all I can say is I can now do just what I like with amidol and strongly recommend it to every photographer for trial.

COLLODION OR GELATINE, WHICH?

BY E. M. ESTABROOKE.

THE controversy at present existing regarding the respective merits of collodion and gelatine emulsion printing-out papers is quite interesting; the more so because each kind has secured such zealous and, indeed, able advocates among all classes of photographers, amateur as well as professional, and from the fact that both kinds are so much used, so that I fear it would be very difficult to ascertain which has the greatest demand.

Having made quite a study of the question, I have arrived at the conclusion that for professional use collodion paper should be considered the most useful and satisfactory for reasons that perhaps might not commend themselves to a majority of that class.

I prefer collodion paper more particularly because of the intractable nature of the collodion, that it will not swell or expand in water, and consequently one secures prints which when mounted lack almost altogether the distortion which results from such expansion, while gelatine is worse in that respect than albumen. Collodion also, while receiving a high gloss, presents a surface totally impervious to atmospheric moisture, and will not, therefore, oxidize and disintegrate, as will both gelatine and albumen from atmospheric influences in the course of time.

These two qualities alone render the collodion paper preferable, in my opinion, to gelatine, for as regards ease of working there seems to be no comparison, while for richness of tone, etc., one is as good as the other.

Gelatine paper commends itself to the amateur, and justly so, because of facility of working and beauty of results, for the amateur, not offering his work for scrutiny, may not be expected to consider permanency of exceptional value, while the professional should in all honesty strive to give that quality especial prominence in all his work.

The reasons given here for a preference for collodion paper, if carried to their logical conclusions, would exclude

all the non-curling collodion papers and lead to a preference for that which showed the greatest propensity to curl as possessing the heaviest and fiercest coating of collodion emulsion.

I have arrived at the conclusion, therefore, that, given an emulsion containing a liberal allowance of silver chloride and sufficient elasticity to prevent cracking, collodion paper should fill all the requirements of professional photography, for it is to the professional that we should look for the skill and patience to properly work such papers.

RETOUCHING HELPS.

BY R. W. HARRISON.

A CERTAIN amount of penciling and an unlimited amount of brush work can be done on the dry-plate negative without any preparation whatever; but the brush work is always crude, and leaves white marks on the prints, while the penciling on the unprepared negative is ineffective in the case of nearly everything visible on the print.

Much has been said and written on the preparation of retouching "dope" (as it is now almost universally named), and many and complicated formulas have been given, but simplicity is nearly always best, and I have found by experience that I can use any or all the dopes with equal success. Some years ago I undertook to operate and retouch in a gallery where each of a half a dozen predecessors had made and left behind him a quantity of his pet dope; I used it all up by simply putting a small quantity of it in a one-ounce wide-mouthed bottle and thinning it down with turpentine; the bottle was left open and the solution was dipped out with a small stick. The whole secret is in aerating or oxidizing the turpentine, and if this is thoroughly done no other gum is needed. In my studio the turpentine bottle is never corked, neither are the dope bottles. For a beginning, damar, balsam of fir, or rosin may be used, a very small quantity, about forty grains to the ounce being enough, but as it grows older

and the turpentine gets gummy, little if any gum is needed unless it is being used up very rapidly.

My method of putting it on may be helpful to some. When the solution is fresh it is not as effective as it is later, so to help matters I put on three or four drops, and if the negative does not call for any hard work I simply rub it off dry, with a small piece of Canton flannel folded to four thicknesses; but if the negative is one that has freckles or kindred calamity, I take the rag and rub it lightly over the four drops of dope to spread it on, then I stop for a moment and again begin to rub, but not yet on the face or places to be worked, but merely to dry the edges; in the meantime the thin film over the face has been getting tacky, and it is briskly rubbed, and the more it is rubbed inside certain limits, the better the tooth will be. I like to keep the same rag and use it till it gets too full for usefulness, when I reluctantly start a new piece, still retaining my old piece for difficult negatives, until the new rag has got a little gummy.

Some people are afraid to spread the dope over the negative, saying it catches dust, but if used in the way I indicate, it will not catch dust, and will prevent patent papers from sticking.

With this system I can ordinarily put all the work on a negative that I wish, but sometimes it is desired to do some still heavier work in hair or drapery, and I have found the following very effective:

Gum sandarac	35 grains
Ether	2 drachms
Gasoline	6 ounces

Dissolve the gum in the ether, add the gasoline, and shake.

This is easily made and inexpensive, and after shaking awhile can be used at once, although it is better and cleaner to let it settle. It should be simply flowed over the plate like a varnish and not heated. The bottle containing this should be kept well-corked, and the varnishing done at a distance from flame.

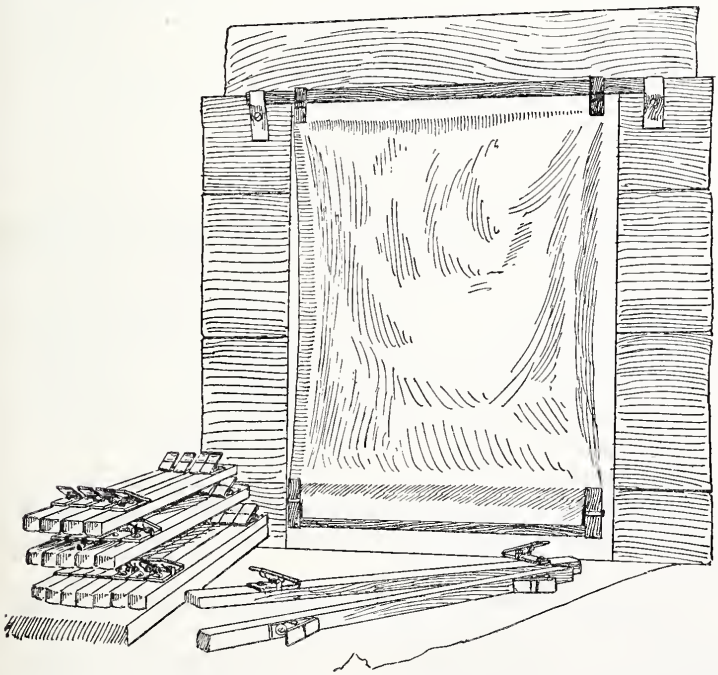
For helping out a negative where parts are too strong I have found it good to take ground-glass substitute, add a

little crimson aniline dye to it and flow it on the back of the plate; the lights can be scraped away, and shadows left covered with the dyed solution. This, of course, must be done carefully or the edge will show. This is especially effective in landscapes where the negative has clouds which do not print.

A DEVICE FOR DRYING SILVERED PAPER.

BY C. M. DARLING.

I USED to hang my paper, after silvering, to cards, by clips; but in looking for a better way, hit upon the device illustrated herewith. This consists of a wooden rod, dimen-



sions ¾ x ¾ inches and 23 inches long. At 3 inches from each end, on one side, is pivoted a clip. The corners of the

sheets at top and bottom, after silvering, are put into the clips; as the sheet contracts in drying, the clips turn on the screws, which pivot them. The sheets are thus kept constantly tense by regulating the tension of the screws.

I put the ends of the rods into a row of notches made for them in a wooden partition, about four feet above the floor, in an open room.

A gas stove on the floor supplies heat to dry the sheets; after they are dry they are transferred to the fuming closet for the requisite time.

The details are shown by the cut, and scarcely require any explanation. A slight groove, to allow for the projecting brass hinge of the clip, enables the clip to be turned parallel with the rods, which can thus be stored very compactly.

THE STRUCTURE OF HYDROQUINONE.

BY E. L. BOWLUS.

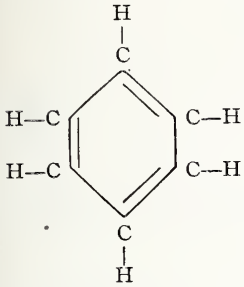
I SHALL endeavor here to explain the molecular structure of benzene, with the view of making clearer the molecular structure of hydroquinone, which is to follow.

This developer is a hydroxyl derivative of benzene, which substance, by the way, is not to be confounded with benzine, which is a mixture of the lighter boiling oils of petroleum. The molecular formula of benzene is C_6H_6, and contains by weight 72 parts of carbon (C) and 6 of hydrogen (H).

This formula gives no idea of the relation of its constituent atoms, but in the structural formula about to be given we have a good mental picture of this—its constitution.

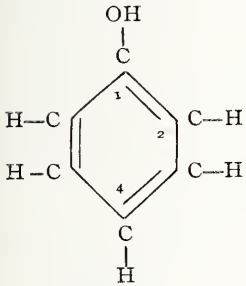
The author of this formula, basing his idea upon the quadrivalence of carbon, supposes each carbon atom to be in possession, as it were, of four arms whose hands can grasp and hold in combination with it four univalent or two bivalent residues.

The formula of benzene is as follows :



Each little line representing the union which binds together two similar or dissimilar atoms.

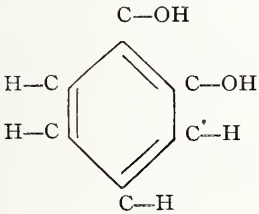
Any one of these hydrogen atoms (H) can be replaced by a given residue, and since all are equivalent the product is the same no matter which hydrogen is replaced; but this is different in substitutions of phenol or carbolic acid because of the presence of the hydroxyl group OH (oxygen + hydrogen).



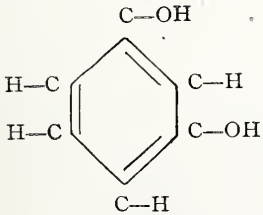
Phenol.

It is evident that if another hydroxyl group be substituted for a hydrogen atom, the relation between these two OH groups may differ in three different ways which correspond to the positions 2, 3 and 4, ortho, meta and para positions.

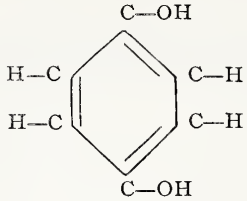
The substances formed by replacing one hydrogen of phenol by OH are also as follows :



Pyro catechin or Ortho-di-hydroxy Benzene.



Resorcin or Meta-di-hydroxy Benzene.

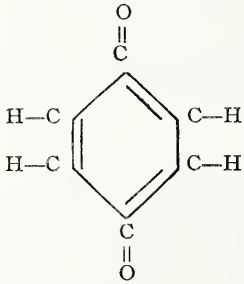


Hydroquinone or Para-di-hydroxy Benzene.

Hydroquinone will now be seen to be a benzene molecule in which two hydrogen atoms are replaced by OH groups, these groups occupying positions as far apart from each other as possible.

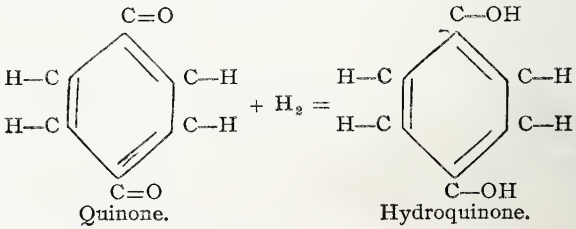
The reasons for believing that hydroquinone, in molecular structure, is one of three isomeric di-hydroxy substitution products of benzene, in which the substituting groups occupy the para position, must be taken for granted as an explanation is far beyond the limits of this article. Hydroquinone is so called because it is derived from quinone by reduction with nascent hydrogen. It is hydrogenized quinone.

The constitutional formula of quinone is as follows:



Quinone.

Chemically, this substance is very interesting because of its possession of two carbonyl groups, C = O (carbon and oxygen), and has been called a diketone from its analogy to the structure of those substances (ketones) obtained by the oxidation of secondary alcohols. By treatment of quinone with nascent hydrogen one bond of bivalent oxygen in each carbonyl group is removed from its union with carbon and is employed in holding in combination one atom of univalent hydrogen, thus:



Quinone. Hydroquinone.

By oxidation of hydroquinone we get quinone.

FIXING AND WASHING.

BY W. H. SHERMAN.

WEIGH a sheet of albumen paper; then after silvering, blotting and drying, weigh it the second time; you will find that the silver salts have added 25 grains to its former weight. This is almost exactly what I find the difference to be. It will vary a little with stronger and weaker silver baths. These silver salts are the chloride, free nitrate and albuminate, and of these about 5 per cent. will remain in the image, some of it will be left behind as paper waste and some will be washed from the prints in the form of free nitrate; so that all that will remain for the hypo to dissolve in fixing the prints, are the alterable chloride and albuminate, at the outside, not more than 18 grains per sheet. But we can afford to make liberal allowance for all possible contingencies, and so will give it credit for dissolving the whole 25 grains. To dissolve this, not more than 62 grains of hypo can be expended.

If the prints are fixed in a hypo bath of standard strength, which I assume to be 55 grains to the ounce and 8 ounces of solution to each sheet, there will still be, after the prints are fixed, 47 grains of unused hypo in each fluid ounce of the bath.

Now, what I would like to know, is: Why the fixing is not completed in this bath, and of what possible use a second and weaker fixing bath can be to prints completely fixed?

A print is not fixed when the silver chloride is converted into the hyposulphite of silver; this last must be redissolved and thus become the hyposulphite of silver and sodium. If the first salt only is formed, and is in that state transferred to plain water, the print which holds it can never be fixed by any solvent that would not destroy the print. In fact, the single salt is never formed in presence of a large excess of hypo; it gets no further than the nascent state, then instantly disappears, or rather never appears.

Why a fixing and washing of prints need be followed by a second fixing and washing as recommended by Dr. Miethe, is an insoluble enigma to me.

Still less do I comprehend the assertion by the same writer, that ten minutes washing in running water will remove all soluble matter from them.

Doubtless a single print might by the vigorous use of a sponge, be washed in that time; and probably water might be driven by pressure through a lot of them in such manner as, regardless of consequences, to effect the same result in the same time, but if any ordinary methods of washing are meant, then to the best of my knowledge and belief there must be some mistake. Prints, whether albumen or aristo, must have gentle treatment. They cannot be tumbled about in water very much without suffering injury in consequence. If they remain quiet or nearly so, even if the water is running over or between them, they part with their hypo very slowly. I have had a strong stream running into one corner of a large pan containing prints, while an equal stream was drawn from the bottom through a siphon at the opposite corner, for hours, when on testing the water for hypo and not finding any, then after stopping the running of the water a short time, have detected its presence again. This shows how sluggishly a weak solution of hypo is absorbed out of the pores of the paper into the surrounding water, even when this is in motion.

The question is not whether there is any hypo in the running water, but whether there is any in the prints? How to dislodge it from the paper is the problem to be solved. If ten minutes in running water would do it, how happy we should be. Hypo eliminator's occupation gone. Sponging and squeegeeing to remove it unnecessary. Permanent prints found at last!

Of all the new things to which we have been treated during the last few years, what is there of more real value than this simple discovery, to wit, that running water will wash all the soluble matter out of prints in ten minutes?

But with all due respect, I must decline to accept it as proved or demonstrable. I have been trying for twenty-five years to find how to get rid of the hypo from prints in some better and quicker way than by long washing. There may yet be some better way devised, but it will hardly be by short

washing. It takes time, and plenty of time. This is the secret of thorough washing. Running water is all right when the supply is unlimited and great waste to little purpose, is of no consequence; but the most satisfactory way which I have found is to let the prints soak in, say, a quart or more to each sheet, changing the water once an hour, thoroughly draining each time, and turning over the prints two or three times in each water. Hot water hastens the removal of the hypo, and so does sponging. Five such changes (without hot water or the sponge) does *not* remove the hypo, so that a reliable test will not detect its presence in the sixth water.

Long washing certainly entails a loss of brilliancy in the prints, so that the choice seems to be between less brilliancy and more hypo. But this tendency to deterioration seems to be prevented by the use of a little of a 5 per cent. solution of carbolic acid (1 to 2 drachms in each gallon) in the washing water.

Every photographer must choose and decide for himself whether his prints shall have hypo in them, or not, when they go from his shop, or studio, whichever it is. They may go out in either state as he wills, provided he has trustworthy assistants, and has made his wishes understood. But it will not do to place much reliance on guessing. Nothing short of a sure test of hypo can be depended upon, and it is not always that the so-called are sure. For example, the permanganate test which is, perhaps, the most highly recommended of any, is in some cases entirely unreliable, on account of impurities in the water. Rain water from roofs often contains organic matter which will react with this test very much as hypo does. So will carbolic acid in the washing water render it useless.

Probably nothing is better for this purpose than silver. Make a weak solution of the nitrate, 15 or 20 grains to the ounce, and after the prints have remained from a quarter to half an hour in *non-running* water, fill the test tube from the bottom of the vessel and add one or two drops of the silver solution. If the fixing was followed by the salt bath (as it always is, or should be, with paper liable to blister), the contents of the test tube will show a white precipitate of silver

chloride, or, if no salt was used, and the water is hard, there may be a similar appearance of silver carbonate. If hypo is present these precipitates will (after a time) turn brown or yellow, or hypo alone with the silver will produce a like effect. When the silver produces no color but white, no hypo is present, or so little as to do no harm.

Remember the drama of the Silver Print is a play of five acts: The first puts plenty of silver in the paper; the second, plenty of gold in the prints; the third, plenty of hypo in the fixing bath; the fourth puts the prints in plenty of water; the fifth and last, puts the last trace of hypo out of them.

ON KALLITYPE.

BY DR. JULIUS SCHNAUSS.

THE, at one time, almost exclusive use of ferrous oxalate as a developer for gelatine emulsion plates has presumably been the cause of the use of ferric and ferrous salt in other directions—printing methods. In this way have originated platinum printing, kallitype and many other similar processes, in all of which the ferrous salt (oxalate) takes the part of a reducing agent, and respectively that of a developer, whether the salt enter as such directly into the compound, or be formed from ferric oxalate by the reducing action of light.

Sir John Herschel was the first to experiment with ferric salts—the citrate and the oxalate—but used the salts of gold, or mercury, as a foundation for the picture. Herschel's description of his processes are not very clear, and it is next to impossible to obtain satisfactory results by following his directions. Dr. Nicol, of Birmingham, was probably the first who gave rational formulæ for using organic ferric salts for printing methods. He improved and corrected W. J. Harrison's method, and a patent was granted to him in the British empire. But through all these manifold improvements the process has become very complicated and confusing, so that but few careful operators will be able to use it with success.

Sarah J. Eddy. The Franklin Engraving Co., Chicago.

MAY I SEE?

The methods now in vogue are mainly by developing, when the silver as it were assumes the part of the developing agent, or, better perhaps, takes the place of the iron of the prepared and exposed paper. In this process, ferric oxalate or ferric citrate combined with silver are spread upon the paper and exposed to light when dry. Developing is done in a bath of Rochelle salt (a double salt of potassium and sodium tartrate), to which borax is added, and a trifle of bichromate of potassium which acts as a restrainer. The feeble iron picture is intensified by the developer, and a substitution of silver for the iron takes place. To fix these proofs, that is, to remove from them all possibly adhering iron or silver salts, they are mainly washed in water, or in water containing small quantities of sodium citrate and ammonia.

Besides the developing processes, there are many printing-out processes, with which the proof assumes full vigor and brilliancy by extended exposure to light.

The ferric oxalate is here also combined with silver nitrate and potassium oxalate, the solution spread upon paper, and when dry washed in an aqueous solution of citrate of sodium, acidified with citric acid, and finally in much diluted ammonia and pure water.

I have made extensive experiments with these complicated formulæ, but alas! without desired results. Ferric oxalate mixed with silver nitrate in any proportion produces necessarily a precipitate of argentic oxalate, which, however, dissolves by adding to the solution a few drops of nitric acid or ammonia.

If the ferric oxalate or citrate has been prepared directly from ferric chloride by precipitation with ammonia, the precipitate of ferric hydroxide must be subjected to a thorough washing. Should but a trace of chloride remain, the formation of silver chloride would be induced, which is also soluble in ammonia but would eventually act injuriously. For that reason I prefer the ferric citrate, when chloride has not such an influential action.

Rives or Steinbach paper is floated for fifteen minutes upon the clear, light-brown solution and dried. From a clear negative of average intensity a brilliant proof may be

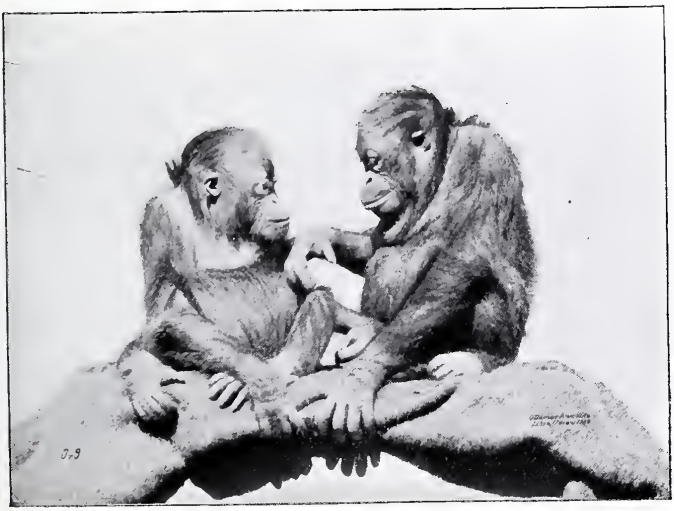
obtained by comparatively very short exposure; it is but feeble but will be intensified by subsequent treatment. The bichromate in the solution acts as a restrainer in cases of over-exposure, and Rochelle salt and borax are its main constituents.

On drying the paper the ammonia of the sensitizing solution volatilizes, and the finished proof must therefore be washed in a dilute solution of the same substance.

The so-called printing-out papers are subjected to similar treatment. In reality there is no difference in the two methods, excepting the long time of exposure to print-out.

The salts of iron in solution have a great tendency to sink within the paper mass, and paper to be prepared with them requires to be sized. Arrowroot, gelatine or other glutinous substances do very well.

The absence of hyposulphite of soda in the ferri-argentic printing processes is one of their greatest advantages, but were we to attempt to tone these pictures in a combined bath, sulpho-cyanates must be avoided on account of the iron, and then by using hypo in the bath with gold, that advantage would be entirely lost.



AN INTERESTING NARRATIVE. By O. Anschutz.

DOUBLE PICTURES.

BY C. FRANCIS JENKINS.

By C. F. Jenkins.

DURING my investigation as to the best means for perfecting the phantoscope, mentioned elsewhere, the success of which is in a great measure due to the untiring assistance of Mr. I. D. Boyce, of Washington, many new uses for sensitive films and dry-plates were discovered, and, as a recreation, I made, among others, the pictures herewith represented. To those who do not already know it, a description of the method employed in each case may be interesting, and I should be very much pleased to examine the novel and ingenious photographs which a study of these may suggest.

To secure the "double pictures" I place a square piece of paper, preferably black, in front of the lens a distance equal to about 3/8 of the back focus, and in such a manner as to obscure one-half the field of the lens. An exposure is now made and the paper turned over so as to cover the other half of the field and another exposure is made. In the meantime, however, any object or objects in the exposed half of the field can be transferred to the other side before the lens is uncapped the second time. Of course the camera must not be moved until the work is completed.

By means of these double exposures the spiritualists' ghost pictures are made—at night by flash and in the daytime by sun-light—the necessary incantations being more fitly associated with the darkness, however.

For the "moon pictures" I take an ordinary photographic negative, carefully remove the emulsion from around the figure, and with "opaque" paint on the moon and stars, and print.

Decapitation pictures can easily be made in this manner, or by means of double exposures. In the former, the body is

carefully removed, leaving the subject's head suspended in the hand, or in any other manner desired.

Another suggestion: Place the camera close to a mirror in such a manner as to get the image of a subject writing, and the ease and naturalness with which the pen or pencil is held will convince any one that the person is left-handed.

Just one more, and a practical one: Not long since, in my work as an engineer, I was requested to ascertain, approximately, the thrust of a bridge, in going over which the brakes of a railway train were applied to stop it at a station a few hundred feet beyond. The quickest and most convincing way that occurred to me was to take a double photograph of the bridge, one before the train reached the bridge and the other while crossing. The developed negative showed conclusively that the bridge had moved several inches during the passing of the train.

By G. T. Greenleaf, M.D.

"A GOOD STORY."

THE BELLEVUE VERTICAL CAMERA.

BY O. G. MASON.

WITHOUT entering into any discussion—which would be quite out of place here—as to where, when and by whom the first vertical camera was made, the mere statement of a fact well known to many American photographers that they have, in one form or another, long been in use, is of itself sufficient indication that the exigencies of various work has called for some such device. They have been used by botanical, geological, mineralogical, pathological and chemical investigators many years; and I am well acquainted with one commercial photographer who has long used a vertical camera for illustrating catalogues of jewelry and other small articles in various lines of trade. Many of these cameras have been temporary arrangements, unhandy to use and unreliable in results.

With the wish that all who have such instruments would contribute to our fund of knowledge by description and illustration, I herewith furnish something concerning the one which I use in my own practice at Bellevue Hospital; let others do likewise, and after a careful study of all we may be able to construct an instrument far better than any one of us now possess. The component parts of the Bellevue vertical camera are so clearly shown in the accompanying illustrations, that very little more than dimensions and a few words regarding some of the minor details is required to make it fully understood.

Upon a substantial platform, about three by four feet square, is erected and strongly anchored a rigid upright, held in position by lateral braces. In front of and to this upright is fastened a well seasoned plank, having a smooth, flat face, and perfectly parallel edges. This plank stands eight feet high, and is fifteen inches wide; to it are attached all other parts of the instrument.

The reflectors, of glass, paper, tin, etc., etc., are in most cases detached, for greater convenience in placing at such angles as may best suit the objects being illustrated. All

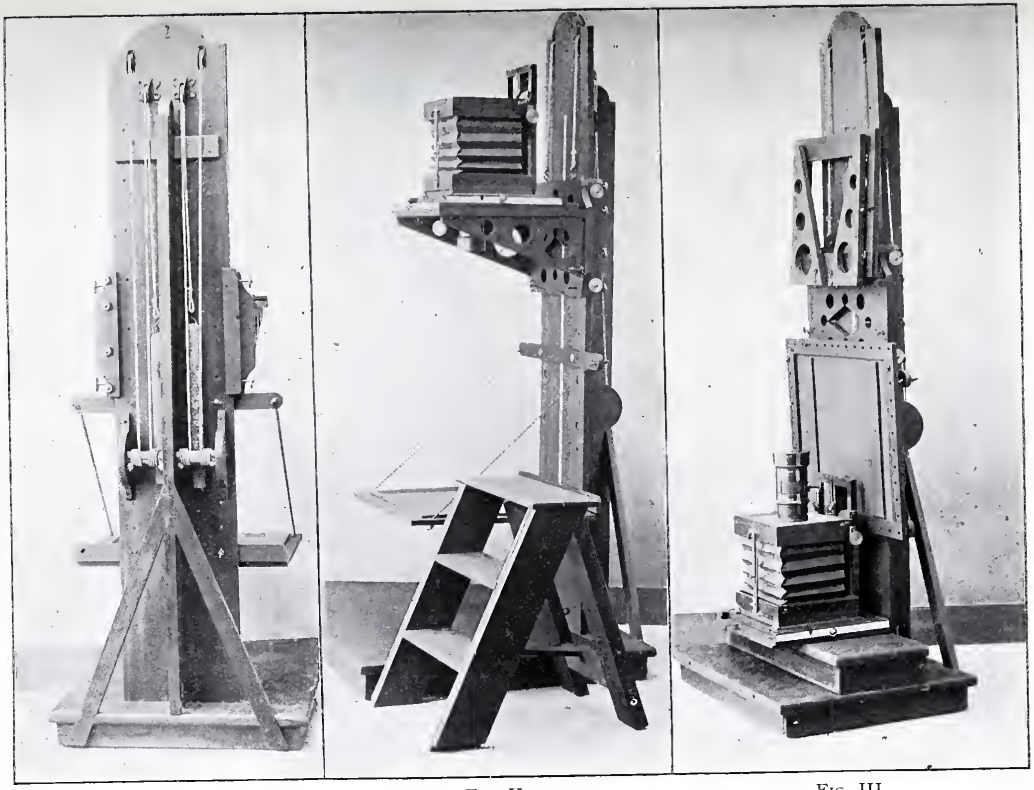


Fig. I. Fig. II. Fig. III.

the accessory parts are held in place by loose bolts and thumb-screws, by which their relative positions may be quickly changed or reversed.

The object platform or table consists of a rabbeted frame so hung by hinges and adjustable chains that it may be kept level or swung to a desired angle.

A line of holes runs along each edge of the frame—most clearly seen in Fig. III.—for adjusting the hanging chains and for pins or cords used in holding objects in any chosen position.

Into the rabbet of this frame are laid the supports for the objects under treatment, unless they are contained in heavy receptacles or are bulky, in which case they are laid on the platform, a bench, or other strong foundation.

These supports, for my usual work, are twenty by twenty-four inches in size; they consist of wood one-half inch thick, strongly cleated on the back or lower side. Some have low rims for retaining leakage from objects and some are perfectly flat. They are painted white, black and various tints, while some are covered with India rubber or oilcloth. Glass, plain, ground or colored, or whatever other material may best suit when working by transmitted light, are also used.

The camera box rests upon a series of sliding frames, running over each other between properly rabbeted guides, all held in position by folding brackets, as seen in Figs. II. and III. These bracketed frames are hinged to a carriage running up and down the upright plank. This carriage is held firmly in position by thumb-screws passing through its guides, as shown in all of the figures.

The front of the camera box has a double automatic sliding box which prevents the plate holder or other top weight from depressing the front of the plate holder section of the box. Along the centre of the upright plank upon which the carriage runs is fixed a scale—shown in Fig. II.—by which the position of the lens, relative to the object, may be read and recorded. The frames upon which the camera box rests are also provided with scales, by which the position of the lens in horizontal plane may be read each way.

The instrument is worked from an extension ladder, shown in Fig. II. at its lowest attitude. The stability of the frames, brackets and upright is such that a 14 x 17 camera may be carried without tremor, as seen in Fig. II.

Fig. I. shows arrangement of pulleys and counter weights by which the carriage and camera are balanced. A slight pressure of the hand up or down puts them in action, and a turn of one or more of the round-head thumb-screws fixes all in position.

Fig. III. shows the apparatus, folded for economy of space, in a vacant corner of the room, to which it is easily run, as the whole device is mounted upon Martin's double wheel castors which raise the platform about one-fourth of an inch from the floor.

The platform is made in two sections, which hook together when the whole size is required.

By Alfred Stern.

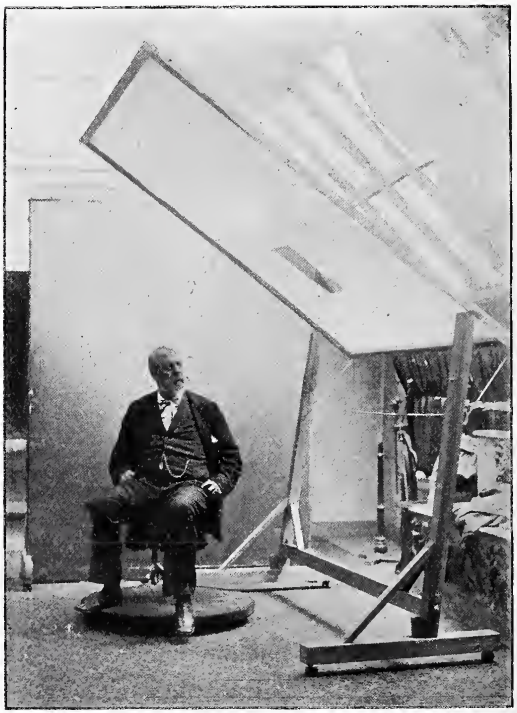
CARMEN.

SCHEME FOR LIGHTING.

BY JAMES F. RYDER.

TO light the subject favorably I give you what to me seems a perfect means. It matters little what be the form or manner of your light. The introduction of a screen between the light and the sitter, when properly adjusted, will make a good light of what would be the most unfavorable one if used without the screen.

This screen may be carried upon a framework, upon castors, from the floor, or it may be hung upon wires overhead and adjusted and operated by means of pulley cords. It should stand at an angle of from 30 to 45 degrees, as in the judgment of the operator shall seem best. It should be of common white muslin. It should be at a distance from the sitter's head of about three feet. It should be of size large enough to shut off the entire light from the top or side light, or both; for instance, when the sitter is in the chair and the screen properly adjusted, the sitter should not be able to see



THE SCREEN IN USE.

anything of the window outside the frame which carries the screen, then surely no part of the window can see the sitter, which is the point we wish to make. Under this screen, now, you have nothing but diffused light. The lights, or lightest parts of the face, are shielded from the direct light of the sky or side lights, or both. The shadows are filled with light enough to give them detail and transparency, rather than abruptness. To most operators the effect of this screen gives too flat an effect and would be condemned. The image is too much all half-tone. But hold on a minute. I admit the claim of too much half-tone—of too flat effect. We can fix that.

Let us cut in the centre of the screen a hole, say a foot or a foot and a half wide, and say two feet long, the length to run up and down of the screen. Now this bit of *direct* light coming through the diffused or obstructed light emphasizes the effect—gives a mark of high-light upon the prominent parts of the face, and at once changes the flat effect to pleasant points of light, and deepens the shadows. To get this hole correctly adjusted so it gives the proper effect belongs to the operator to see and to do.

While it is possible to make use of this device for figure portraits, when the screen is suspended from above, it is meant more especially to be used in making heads, where its greater value will be found.

By Geo. Arkwright.

STRAYED.

THE NEWEST EPOCH IN PHOTOGRAPHY.

BY J. GAEDICKE.

By H. Troth.

THE fact that photographic work has reached perfection, so far at least as the making of pictures in black and white is concerned, enables us to enter a new stadium in the pursuit of our vocation. By means of the great variety of our accessories, the advances made in optics, in the manufacturing of plates and printing papers, and the introduction of new developers, there is really no difficulty encountered in making faultless pictures. In fact, photography has reached a highly elevated point, and with it the aspects for the future have immensely widened.

Photography has entered upon artistic territory, but has she the right to ask for admission upon that wide field? The question can doubtless be answered affirmatively, inasmuch as the late expositions in Vienna, Hamburg, London and Paris, all arranged upon purely artistic bases, were the first practical efforts in that direction, and they were eminently successful.

There is in reality but one art. It is divided into several branches, according to the means adopted to give expression to an idea. There is brush and pencil, chisel and mallet, the architect's granite or marble, there is poetry and music. Through tone and word the work is accomplished, and is then a piece of art. Why should not the camera be also admitted among these different branches.

That photography is abundantly able to express artistic ideas has been proven in many ways, and in innumerable instances, but its position is of far greater difficulty than that of the painter or sculptor. Photography represents the naked truth by its means imperfections or defects in the model

By Lydell Sawyer.

ON THE TYNE.

cannot be remedied or improved, and he adopts other means to perfect on the finished or unfinished plate what nature has denied.

The painter has a composition worked out in his brain, and when executing it he models and beautifies what is defective in the subject; he idealizes his picture.

The purpose of works of art is to produce pleasing and agreeable impressions upon the mind of the beholder.

Dillega, in defining what works of art are, speaks of a very amiable man, not highly educated in art matters, but of fine taste and excellent judgment. When his attention was called to a special piece of work, and when he said, "This is a masterpiece," the most severe critic could not say *nay* to it. When asked once how he came to these conclusions he answered: "When I look upon a piece of art and a chill runs over my whole body and my hair vibrates in its roots, my opinion is formed."

An excellent characteristic of the powerful influence of a piece of art, still more impressive, perhaps, by a musical composition, is a well composed landscape, more impressive, perhaps, when containing objects recalling reminiscences of our own life.

Now, you Apostles of Helios, let us try to produce pictures like the above-mentioned, and with all their striking effects, and our photographs will be artistic; but the first condition for success is a deep study of the general ideas of artistic design.

By H. Troth.

GLOUCESTER HARBOR.

The Photo-Chrome Engraving Co. By Napoleon Sarony.

EDNA WALLACE HOPPER.

THE FLASHLIGHT AS AN AID TO DAYLIGHT IN PORTRAITURE.

BY W. J. HICKMOTT.

IN making copies it is quite practicable to make the negative in the evening by the aid of the flash lamp, and it is equally as practicable to help out weak daylight by the same means in portraiture. All of my portrait work has to be done after four o'clock in the afternoon, and it is needless to say that very often the light is not very strong after that hour. By giving long exposures it is possible to work quite late under the skylight, but it is not always possible to give long exposures. I have therefore at times used the flash lamp to good advantage in helping out the daylight. It is not necessary to go to great expense in the matter of the flash apparatus. In my own practice I use the Prosch storage lamp, and my method of operation is as follows :

The subject is posed just as if daylight only was to be used so far as the side light is concerned. If the light is very weak I draw back the screens under the top light, letting in all the light possible. It will not usually throw too much light upon the head late in the day. I set up the flash light about five feet from the sitter and at a height about even with the shoulder. Back of the flash lamp I put a reflector made of card-board. On the opposite side of the sitter from the flash lamp I put a white reflector, using my head screen for this purpose, so that the shadow on that side may not be too strong. When all is ready I light the flash light wick, draw the slide in the camera, blow gently into the flash lamp, making a brilliant light, and while still blowing press the bulb connected with the shutter, making the exposure as quickly as possible. It is well to begin to operate the flash lamp a moment before pressing the bulb. It wastes powder perhaps to do this, but you are sure then you get the full benefit of the flash. I have no assistant in making the exposure. I take the end of the flash lamp tube between my teeth and give a good strong puff, making a big flash of light, and while still blowing give the bulb a quick

pressure. The exposure must be made very quickly or a bad case of over-exposure will result. If there is not sufficient shadow on the side of the face opposite the flash lamp move the reflector further away. It is necessary to have the reflector there, as without it the shadow would be very heavy. For groups the flash lamp can be used to good advantage in lighting the sitters farthest from the side light.

HINTS ON HAND CAMERA WORK.

BY HENRY L. TOLMAN.

IT is probably well within the truth to say that over one-half of the snap shots that are taken with hand cameras are failures from one of two causes: 1, error in time; 2, error in distance. The first cause affects the plate in two ways; an over or under exposure may prevent proper development, or the over-exposure may be so great as to cause moving objects to appear blurred in the negative. The second error also is shown in two different ways. It may produce a distortion, as when near and distant objects are grouped on the same plate with a very short focus lens, or it may prevent the photographer from getting the whole of the image on the plate, by being too near the object. It is not always possible to look at the ground glass, and with snap shot work of course this cannot be done at all. Even the finder is not always available. Moreover, there is a large class of work where the operator is desirous of getting as large a view of an object, such as a building, tree, person or animal, as possible, and any means by which he can ascertain how far from the object he must be, or if the distance is limited, how short a focus lens he must use to include the object, is exceedingly valuable. The table on the opposite page will be of assistance in this direction. It is computed for a lens of 6-inch focus, but a simple proportion will enable anyone to apply any other lens. The horizontal column of figures at the top of the table represents the distance in feet of the camera from the object, or the anterior conjugate focus, and the perpendicular column at the left, the size of

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2	24	8	4.8	3.43	2.67	2.18	1.87	1.60	1.41	1.26	.83	.62	.49	.41	.30	.24	16	.12	.06	.04
3	36	12	7.2	5.14	4.	3.27	2.80	2.4	2.12	1.89	1.24	.92	.73	.61	.46	.36	.24	.18	.09	.06
4	48	16	9.6	6.86	5.33	4.36	3.74	3.2	2.82	2.53	1.66	1.23	.98	.81	61	.48	.32	.24	.12	.08
5	60	20	12.	8.57	6.67	5.45	4.67	4.	3.53	3.16	2.07	1.54	1.22	1.02	.76	.61	.40	.30	.15	.10
6	72	24	14.4	10.29	8.	6.55	5.61	4.8	4.24	3.79	2.48	1.85	1.47	1.22	.91	.73	.48	.36	.18	.12
7	84	28	16.8	12.	9.33	7.64	6.54	5.6	4.94	4.42	2.90	2.15	1.71	1.42	1.06	.85	.56	.42	.21	.14
8	96	32	19.2	13.71	10.67	8.73	7.48	6.4	5.65	5.05	3.31	2.46	1.96	1.63	1.22	.97	.64	.48	.24	.16
9	108	36	21.6	15.43	12.	9.82	8.41	7.2	6.35	5.68	3.72	2.77	2.20	1.83	1.37	1.09	.72	.54	.27	.18
10	120	40	24.	17.14	13.33	10.91	9.35	8.00	7.06	6.32	4.14	3.08	2.25	2 03	1.52	1.21	.81	.60	.30	.20
15	180	60	36.	25.71	20.	16.36	14.02	12.	10.58	9.47	6.21	4.62	3.67	3.05	2.28	1.82	1.21	.90	.45	.30
20	240	80	48.	34.29	26.67	21.82	18.70	16.	14.12	12.63	8.28	6.15	4.90	4.07	3.04	2.42	1.61	1.21	.60	.40
25	300	100	60.	42.86	33.33	27.27	23.37	20.	17.63	15.79	10.34	7.69	6.12	5.08	3.80	3.03	2.01	1.51	.75	.50
30	360	120	72.	51.43	40.	32.73	28.05	24.	21.18	18.95	12.41	9.23	7.35	6.10	4.56	3.64	2.42	1.81	.90	.60
40	480	160	96.	68.57	53.33	43.64	37.40	32.	28.24	25.26	16.55	12.31	9.80	8.14	6.08	4.85	3.22	2.41	1.20	.80
50	600	200	120.	85.72	66.67	54.55	46.75	40.	35.26	31.58	20.69	15.38	12.24	10.17	7.60	6.06	4.03	3.02	1.50	1.00
75	900	300	180.	128.57	100.	81.82	70.12	60.	52.88	47.37	31.03	23.08	18.37	15.25	11.39	9.09	6.04	4.52	2.26	1.50
100	1200	400	240.	171.43	133.33	109.09	93.50	80.	70.59	63.16	41.38	30.77	24.49	20.34	15.19	12.12	8.05	6.03	3.01	2.00
200	2400	800	480.	342.86	266.67	218.18	187.	160.	141.18	126.32	82.75	61.54	48.98	40.68	30.38	24.24	16.12	12.06	6.01	4.01
300	3600	1200	720.	514.29	400.	436.36	280.49	240.	211.77	189.47	124.13	92.31	73.46	61.01	45.56	36.36	24.16	18.09	9.02	6.01

RULE.—From top row of heavy-faced figures get distance of camera from object; from outside column at left get size of object. At the intersection of these two columns in body of table will be found size of object in inches and decimals.

the object. The distance may be reckoned in all cases from the centre of the lens, which though not exactly the correct point is near enough for practical purposes. The figures within the double lines are expressed in inches and decimal parts of an inch. The table may be used in several ways. If, for instance, one wishes to know how far off he must be to get a person standing, using a 4 x 5 plate, he must have the image less than 4 inches. Now a man is nearly 6 feet in height, and looking along the horizontal row of figures opposite 6, until we reach one next below 4, we see that the nearest number is 3.79, and this is in the perpendicular column headed 10. The camera must then be 10 feet away from the person to be photographed, and he will appear to be 3.79 inches in height on the ground glass. Now take an ordinary house about 30 feet high, and by the same process, it will be seen the camera must be 50 feet away, when the house will appear to be 3.64 inches high. If the plate is used vertically the camera may be brought to within 40 feet when the house will be 4.56 inches in height. Suppose, now, the photographer can measure the exact distance from his camera to an object and finds it to be 50 feet and the size of the image to be 3 inches. Then running down the 50 column until he comes to 3.03, the nearest number to 3 inches, and then to the left in the same horizontal line, he will reach the number 25, which denotes the real size of the object, the image of which was 3 inches. So if the image of a distant flagstaff is 6 inches at 100 feet its real height is about 100 feet. So if the exact size of the object, and of its image was known, the distance could be approximately ascertained from the table, and, in short, if any three factors are known, one being always the focal length of the lens, the fourth can be found from the table. There is another curious fact connected with the table, which is that the exact back focus or posterior conjugate focus is shown for every distance given. Suppose, for instance, we wish to know how far the camera must be racked out to focus on an object 3 feet away. If we look at the figure 3 at the top, then run down until we meet the line opposite 3 at the left, we see the numbers 7.2, this denotes both the back focus

and the size of the image of an object 3 feet high at 3 feet distance. So with an object 50 feet away, the camera must be racked out 6.06 inches or .06 of an inch more than its principal focus or focus for parallel rays or infinite distance. As a matter of practice, the eye cannot perceive any difference between the images formed at 6. and 6.06 inches, and in fact, if a moderate size stop is used, all objects at more than 40 times the focal length of a lens can be taken with the same focus, *i.e.*, the principal focus of the lens. For a lens of any other focal length than 6 inches—say, a 7½-inch lens—the size of an object or its image can be found by the simple proportion, as 6 inches is to 9 inches so is the size of the image with a 6-inch lens to + the size of an image with a 9-inch lens.

Now a word as to the kind of a lens to use in hand camera work. A study of the table shows that for near objects the size of the image and hence the length of the back focus changes very rapidly with each change of distance, and unless a very small stop is used objects at less than 20 feet cannot be sharply photographed. The shorter the focus of the lens the shorter this limit, but on the contrary, the greater the distortion or exaggeration, so that a wise balance must be struck between these two difficulties. With a 4-inch lens, everything beyond 12 or 14 feet would be in focus, and for near work, this would be satisfactory. A 5-inch lens, however, is better for general snap-shot work, and the camera should be used with a fixed focus. Undoubtedly there is advantage in being able to focus a near object, but the essence of a snap-shot is its instantaneousness. Focusing means deliberation, and deliberation is fatal to taking an object "on the fly."

A table which was published by the writer in *The Photographic Times*, in April, 1886, and which has been kindly reprinted from year to year in "The Photographic Times Almanac," gave the necessary data by which to determine the time of exposure of objects moving at various rates of speed. This table can be advantageously used in connection with the present one. Remove as indicated when required, to avoid both error of time and error of distance.

FADED GELATINO-CHLORIDE PRINTS.

BY C. H. BOTHAMLEY, F.I.C., F.C.S.

SOME little time ago some prints on gelatino-chloride paper were sent to me, with a request that I would ascertain, if possible, what was the cause, or causes, of the very marked deterioration shown by the prints. Truly they were a sorry lot. Patches of the images retained their original purple color, but in most cases the greater part of the picture had changed to a feeble and sickly-looking yellowish-brown. Here and there, also, there were yellowish stains in what ought to have been the whites of the prints.

The maker of the prints was quite sure that they had been prepared with the greatest care. The only doubt that existed in his mind was seemingly whether the fading was due to the action of the toning bath, or whether it was not simply an illustration of the inherent untrustworthiness of gelatino-chloride paper. How far these assertions and assumptions were well founded will appear in the sequel.

The prints, which were mounted on stiff cards (some olive-green and some chocolate) were carefully examined by methods which it is unnecessary to describe in detail. The interest centres mainly on the results. It was established without difficulty:

1. That the fading could not be attributed to any impurity in the mounts.

2. That where the print retained its original color, and most, if not all, of its original vigor, *there the image consisted largely of gold.*

3. Where the image had changed to brownish-yellow *there was no gold*, and the material forming the image was some compound of silver on which various reagents acted readily.

4. The prints were *strongly acid.*

5. The yellowish substance forming stains in the whites of the prints was silver sulphide.

One point that could not be decided with the quantity of material available was whether the acid substance present in the prints was alum or a free acid. It is abundantly clear,

however, that these prints which, according to their producer, had been "prepared with every care," had, as a matter of fact, *not* been properly toned, *nor* properly fixed, *nor* properly washed after fixing.

The results of the examination of the prints confirmed some views that are generally held, *e.g.*, that the permanence of a "silver" print is, as a rule, greater—the greater the quantity of gold deposited on it in the toning bath, and that a very small quantity of acid remaining in a print may have very disastrous effects in a comparatively short time.

Another point of some interest to which, so far as I am aware, no special attention has been paid before, although it has been referred to from time to time by some writers, and notably by W. K. Burton, is that a print may appear to be toned before any considerable amount of gold has been deposited on it. The prints under discussion were removed from the toning bath in the belief that they were fully toned. As a matter of fact, where gold had actually been deposited, the prints were decidedly purple in color, and it is fair to assume that they had a similar color all over. Yet, as already stated, over a considerable area of the prints there was practically no gold at all. It is probable that this deceptive appearance occurs, or tends to occur, more frequently with toning baths that seem to act rapidly, than with those that act slowly, and this points to the practical conclusion that a somewhat slowly acting toning bath, tending to give warm rather than cold tones, is likely to give more permanent prints, because the deposition of a reasonable amount of gold is more certain. There is nothing new in this conclusion ; attention has frequently been called to it in the case of prints on albumenized paper.

Perhaps the most useful lesson to be drawn from the facts described is, that when damaging criticisms are made against a new process or new materials, it is important to be quite sure of the competence of the critic and the soundness of the reasons on which the criticisms are based. That is only common justice. It may be that the defects observed are really due to improper treatment and faulty manipulation, the assertions of the operator to the contrary notwithstanding.

COLOR SCREENS FOR USE WITH ISOCHROMATIC PLATES AND FILMS.

BY B. J. EDWARDS.

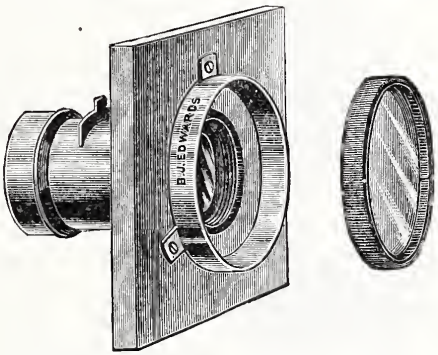
THE use of a colored screen or light filter in connection with sensitive plates is quite an old idea; in the early days of photography it was anticipated that by this means the problem of photography in natural colors would be successfully solved.

In a pamphlet published in Paris, in March, 1869, M. Ducos du Hauron describes a method of using glass screens of various colors for the production of negatives used in his system of heliochromy, his chief difficulty being the enormously increased exposure required with the yellow and red, and until means were found for rendering the plates sensitive to these rays such screens were practically useless. The more extended and intelligent use of isochromatic plates has brought about a general feeling of interest in the subject of colored screens for use in photography, and many inquiries are made as to the best kind and color of screens, and the conditions under which they may be advantageously employed. If a negative be taken through a colored screen on an ordinary plate, the only effect of the screen is to very much increase the exposure without any corresponding advantage; but if an isochromatic plate be used a marked difference will be at once apparent. This is especially noticeable in photographing objects with brilliant contrasts of color, for negatives which are intended to be printed in monochrome, the true and only function of the screen is to cut off a portion of the blue or violet rays, which, although not visually the most brilliant, have an exaggerated effect on the sensitive plate; therefore, if when using isochromatic plates we can intercept or filter out these rays without degrading or interfering with other rays to which the plate is sensitive, we shall not only obtain a more truthful representation of the visual effect, but this object will be attained without unduly prolonging the exposure.

With regard to the best color for screens I find in

practice that these conditions are best fulfilled by using a screen of a pure yellow tint, corresponding as nearly as possible to that near the line E in the spectrum. For ordinary work such a screen will be found preferable to any other color or combination of colors, inasmuch as it cuts off the violet (or nearly invisible actinic rays), and according to depth of tint a portion of the blue, leaving the full power of all the other rays available for work.

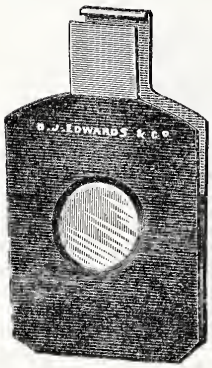
Glass is undoubtedly the best material for screens, and if it could be made of exactly the right color would leave nothing to be desired. The best hitherto obtainable is, however, somewhat of an orange tint, necessitating a rather longer exposure than would be necessary with pure yellow. Much of the glass sold for screens is of a brownish tint and is quite unfit for the purpose. Colored glass which is intended for screens should be selected by careful spectroscopic examination. It must then be optically worked on both sides to a perfectly plane surface; the slightest irregularity would seriously interfere with the definition of the lens. The glass should be cut into a circular disc of the required size and it should be so thin as to cause no appreciable difference in the length of focus. It should on no account be fixed in a metal rim, but should be loosely mounted in a special rim of light paper, or card-board covered with velvet. In this way there is no danger of the glass being bent or distorted by pressure or contraction of the rim, or of being broken if let fall accidentally. The rim may be of such diameter as to fit either into the hood on the front of the lens or on the back of the lens mount within the camera. A convenient method of holding the screen in this position is shown in accompanying illustration.



OPTICALLY WORKED SCREEN AND HOLDER.

This simple form of screen holder enables one to use the same screen with lenses of various diameters. With respect to position there is practically no difference in the result obtained, whether the screen is placed before or behind the lens, or in the interior of the lens mount near the diaphragm. For some reasons, however, the position shown above is to be preferred, as the screen can be easily changed and is not liable to be lost when used for out-door work.

Another and cheaper form of screen, which answers the purpose admirably, and which is much used, consists of a thin film colored medium, which is placed in the diaphragm slot of the lens. The best material for this purpose is a very thin plate of perfectly clear gelatine, stained with a permanent dye of the proper color; in this way a very perfect screen can be made, as the thin film does not interfere and spoil the definition. A convenient method of holding the yellow film in position was designed by the writer some years ago, and has been since extensively adopted. It is shown below, and consists of a thin plate of metal folded at the bottom, and cut to the required shape, so as to form a double stop between the leaves in which the tinted film is placed. The aperture is cut through both leaves of the size required, or the opening may be made of a larger size and reduced by inserting with the film a small piece of thin black paper perforated with a circular opening to correspond with the size of the stop it is desired to use; the total thickness of the diaphragm screen must not be greater than will go easily into the slot of the lens mount.



DIAPHRAGM SCREEN.

Whether these or glass screens be used it is well to have two or three of different depths of tint for various kinds of work.

For copying oil paintings a moderately deep tint is preferable, while for ordinary landscape work a lighter shade is more suitable; if a deeper screen were used the distance would in many cases appear too sharply defined and the

atmospheric effect which is so charming in a good landscape would be lost. In any case, the screen should be used with judgment, and although with isochromatic plates it is not always necessary or desirable, there is no doubt that under certain conditions results can be obtained by its use which could not be produced by any other means. The judicious use of the screen in conjunction with color-sensitive plates offers advantages which can no longer be ignored by those who are desirous of doing the best work.

NEW FIXING SOLUTIONS.

BY MAX MADDER.

AS far back as 1855 the Abbé Labord advised the addition of ammonia to the Blanquart-Everard fixing bath, which was made acid with acetic acid. The object of the ammonia was to prevent the sulphur deposit, which is liable to occur when an acid bath is used. M. Mercier, considering the fact that in this proceeding acetate of ammonia must be formed in the fixing bath, commenced a series of investigations as to the behavior of this substance. He finds that if an alkaline acetate be added to the hypo the solution no longer becomes turbid by the organic acids contained in the photographic printing papers; in fact, the addition of acetate of soda practically fulfills the same end as washing the prints before fixing. The addition of common salt increased the stability of the bath. Citrate of soda has a similar effect, but is more suitable for negatives. M. Mercier's formulæ are as follows:

FOR PRINTS.

Dry hyposulphite of soda	75 grammes
Common salt	25 grammes
Fused acetate of soda	15 grammes
Water	1 liter

FOR NEGATIVES.

Dry hyposulphite of soda	100 grammes
Metabisulphite of potash	20 grammes
Citrate of soda	5 grammes
Common salt	20 grammes
Alum (potash)	20 grammes
Water	1 liter

ON THE DURABILITY OF MY NEW ULTRA-VIOLET SENSITIVE PLATES.

BY PROF. VICTOR SCHUMANN.

AMONG the greatest advantages offered by the modern dry plates, we must reckon their durability and capability to keep good and intact for years even. Without that important property, photography could never have attained the highly elevated point it now occupies, for it is an indispensable adjunct to making photography an auxiliary to the pursuit of science, a most valuable assistant to the mechanical arts and to commerce.

Not alone the high sensitiveness of the dry plates, as has often been asserted, but their durability has been instrumental in reaching that point. The changeability or unchangeability of commercial light sensitive plates plays an important part in their usefulness, and it is likewise if not more so the same with the plates I have prepared to photograph light rays of the least possible wave length, called by me ultra-violet sensitive plates, because with them alone it has become possible to photograph the at present invisible rays, lying far beyond the visible spectrum.

To have these plates at any time at the command of the consumer, the spectroscopist, is as important as the commercial plate is to the professional photographer, inasmuch as to prepare them requires much time and tedious labor, and cannot be proceeded with the same ease as the making of an ordinary plate.

To test these plates for durability and keeping quality, I selected some prepared in October, 1892. They had been kept in a dark closet, quite open and without being enclosed in a wrapper, and were thus subjected to the full influence of the surrounding atmosphere. The plates had rested singly upon a shelf of the closet. Decomposition began to show about the margins of the plate after a few months. The margins increased in course of time, a thick fog at last covering the whole plate.

I began to make my first experiments in the beginning

of the present year (1894). Subject of investigation being the spectrum region 2,000—1852 ÅE., photographed before me by the French physicist Cornu, but by nobody else since, at least to the full extent.

The apparatus used was a small quartz spectrograph with prism of 60 degrees and lenses of 150 m.m. focal distance (Fraunhoferline D); the same instrument that had assisted me to discover the light precincts of shortest wave length, beyond 1852 ÅE., source of light an electric spark, the electrodes aluminum wires.

The result of the experiment was favorable beyond all possible expectation. After keeping the plates two and a quarter years they worked as effectively as on the day they were made. Plate irregularities as mentioned in our article in THE AMERICAN ANNUAL OF PHOTOGRAPHY for 1894, were less perceptible. The plates worked thoroughly clear, and, what is of greater importance, intensity and sharpness were the same as upon newly prepared plates. The intensity had not been reduced as is frequently found with ordinary dry plates kept for a length of time.

In general sensitiveness the plates seem to have lost a little, without detriment to the general effect however. A more concentrated developer than that used for fresh plates will remedy this trifling defect.

These, and other experiments repeated at various times, have impressed me with the idea that ultra violet plates, kept for some time, produced very pleasing results.

The spectroscopist, for whose use alone these plates are destined, is thus enabled to prepare them in advance for future use and in quantities to suit the demand of the times.

With these plates most valuable means are given to examine light regions now and possibly forever inaccessible to the observations of the human eye, but made visible by the tiny light source of the electric spark, opening to us enormous volumes of light on the waves of the shortest length, as has been shown by my spectrophotographs of 1890 and 1891, of the hydrogen spectrum.

A PLATE CLEANER AND A DRY DEVELOPER.

BY W. B. DIMON.

A Plate Cleaner.

AMONG the new things that have become of practical utility in my laboratory during the past year, there is no device more gratifyng in its results than what I call "My Plate Cleaner." For years I had been accustomed to use a mohair brush for removing the particles of dust from my plates before placing in the holder for exposing and just before developing. The mohair brush, now, seems to have found a permanent place of rest around which the spider weaves his web and dances to his own incantations undisturbed.

Pin-holes and spots were my Jonah; now I rarely have them.

Thanks to a mutilated piece of paper one day picked up, which was evidently a part of a page of some English newspaper, which suggested the idea of a plate cleaner. "Many particles of dust," it said, "adhere to the emulsion which require more than a soft brush to remove them. For this purpose rub off with a piece of velvet or chamois skin."

My plate cleaner is made out of one of the sides of a cigar box, measuring 2 inches wide, 8½ inches long, and $\frac{3}{16}$ inch thick. From a piece of heavy velvet cut a piece 8½ inches long and 2 inches wide. With very short tacks along the middle longitudinal line of one side fasten the velvet, plush side up. Then carry it around one edge, drawn taut, and fasten upon the opposite side in a similar manner. It is done. When filling holders or just previous to developing, draw the longitudinal edge of this velvet covered bar evenly over the surface of your plate upon the gelatine covered side and it will remove every particle of dust, however tenaciously it may adhere, without injury to the emulsion. Always see that it is perfectly dry before using. You will be surprised at the disappearance of pin-holes in your negatives.

A Dry Developer for Travelers.

As I have never before imposed upon the ANNUAL any of my ideas about developers, I trust I will be pardoned for the once, inasmuch as I claim no originality for the formula, but make a claim to the method of use and to the practical utility of the same. When I designate it as a travelers' dry developer, I have at once named its purpose and shown its utility. The method may be adapted to your own pet developer if you choose. The method has been my boon for several years. It saves encumbering one's self with several bottles, and much work in the preparation. It is the most economical way. By way of illustration let us take your own pet developer, composed of three chemicals and water. Water is the typical element.

Let us say your formula calls for 32 ounces of water. You are about to develop a 6½ x 8½ plate. It requires 4 ounces of liquid to cover your plate. Then, if 4 ounces develop one plate, your formula of 32 ounces of water will develop eight plates. The amount of chemicals for one plate, then, will be one-eighth of the whole or of each separate part. If 120 grains or 2 drachms of sulphite soda is called for in your formula with 32 ounces of water, then one-eighth, or 15 grains, will suffice for one plate; so with each of the other ingredients. Now have ready two pieces of paper, one common writing paper, and one this paraffine or oiled paper, such as confectioners use; cut about 3 inches square. In the oiled paper place your sulphite and fold it after the style that druggists wrap up prescription powders, and lastly fold it in the writing paper and distinctly write the name upon it. In the same manner wrap the other chemicals and put them in a small tin box, and you will be surprised how well they keep, and what a convenience it will be to you.

My pet formula, based upon the amount that is necessary to develop one plate, is as follows: 7½ grains hydroquinon, 15 grains sulphite soda, and 30 grains carb. potash or 2 liquid ounces of saturated solution of sal soda. I fill my graduate to the one ounce mark with pure water (melted ice preferably) and empty one packet marked sulphite of soda.

When dissolved, I add the quinon, and when it is dissolved I add the packet of carb. potash and 3 ounces cool water (60 deg.) and proceed at once to develop.

The amount for one plate is capable of developing three 6½ x 8½ plates, but I seldom develop more than two. This is made ready in fifteen minutes and at a cost of but one half-cent for two plates. Water only is used as a restrainer.

I claim every amateur going from home should make his burden as light as possible; that he should know within twenty-four hours what he has on his plates, that he may correct errors while opportunities are convenient; that he should make his own developer and be conversant with its action if he wishes to get satisfactory results. Without satisfaction there is no fun or comfort.

MOUNTING.

BY A. M. ROSS.

CARD mounts, for single, duplicate or unrelated photographs, are well enough and it may be unnecessary to enumerate the disadvantages of this ordinary way of mounting, but as it is very unsatisfactory, particularly in the case of a set or series of views, it is well enough to speak of some of the bad features. We all know to our sorrow with appreciative but over solicitous friends, how easily a set of photos may be broken, and our lack of time to fill the gap, leaving the set incomplete. The separate cards are soon dog-eared, finger marked, scratched, etc., and it is impossible to keep any order in the arrangement.

In the case of a tour or summer vacation, it seems to me that a set of views may be selected so as to give excellent artistic effect, and at the same time so taken and afterward arranged as to constitute a story in itself; of course the idea of this result being held subordinate to the one of obtaining the most artistic effects.

Therefore more of interest or pleasure may be drawn from one of a series than could be drawn from it by itself, and it has its own place to be there kept. An album is

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therefore necessary, and a neatly home-made one with light flexible covers is quite superior; many excellent ways of going at the making of one have been published. But before coming to that let me consider the prints. Bromide prints with wide margins to be bound in without mounting, are elegant before they become finger-marked on the edges, but as an eraser cannot be successfully used on the film I prefer to work differently.

I have two home-made albums before me that I will describe. One is of bromide prints in velvety black tones mounted on wide-margined water-color paper, pure white,

the prints being tacked at their extreme edges with Higgins' mounter. The paper is thin, with a print on each side, but as they are mounted dry the leaves lie perfectly flat. The cover is of the same material, but heavier, rough, and of the "robin's egg" blue tint. It is reinforced through the centre and has a title and blue print made on the upper and lower half of the upper cover, put on before the reinforcing strips, etc. The album No. 2 is of the same material, but its color —cover and leaves alike—is a pale shade of pink, selected to harmonize with the warm tones of Solio paper. Both albums are made up by the ordinary eyeletting and cord tie.

I send herewith a copy of one of my frontispieces to illustrate one way of arranging a few views and incorporating with them some of the attractive things, mementos, etc., that may be gathered in the vicinity where the views were taken. As in this case, some birch bark, pine cones, parasitic and sea moss, some sweet grass, etc. Such things can often be effectively grouped. Though they may not add to the pictorial effect they help to tell a pleasant story.

THE PRUSSIAN CAVALRY. Lt. Joachim Steiner.

SOME USES OF PHOTOGRAPHY IN MEDICINE.

BY EDWARD LEAMING, M.D.

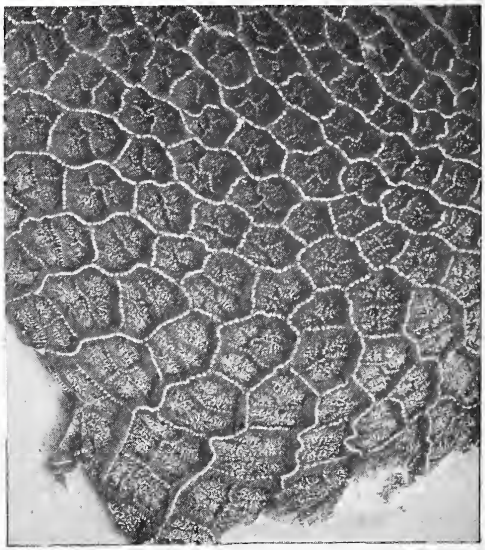
AT the present time scientific photography is largely made use of by the varied sciences comprised under the name of medicine. I use the term "scientific photography" because what is known as artistic photography is not sought after; what is desired is an accurate delineation of the facts as they present themselves to the eye of the observer, and if such a photograph should have an artistic value as well, so much the better, but it would be entirely adventitious. In surgery it has been and is now more than ever used as a reliable delineator of the appearances of the subject before, during, and after operation, and likewise in clinical medicine its use is growing, as certain diseases before and after treatment show marked differences in the appearance of the patient, which the camera is enabled to graphically depict with slight loss of time and trouble. In

the two foregoing classes of cases the *modus operandi* of the photographer does not essentially differ from that of ordinary portrait work, but as a rule under vastly greater inconveniences and difficulties of working. When we come to pathology we have two entirely distinct methods of working—photographing gross specimens, which is photographing small inanimate objects, and photomicrography, which is the production of enlarged images of the whole or portions of thin sections of the object, generally through the microscope. Some may think here that such pictures are always taken through the microscope, but this is not necessarily the case; sometimes the area of the section that we wish to photograph is so great that no microscopical objective that we may have will be of low enough power to include it all in one field of view. In such a case our object is accomplished by using a photographic objective—a wide angle lens of short focal length will be found most convenient, as it renders the apparatus more compact—with reversed foci, that is, just as you would do in enlarging a small negative, the lens being nearer to the object than to the ground glass screen. This will make a photomicrograph just as surely as if you had used a microscope, and the process of making photomicrographs, by the way, very much resembles the

By Ed. Leaming.
Portion of brain showing tumor of medulla oblongata. Reduced.

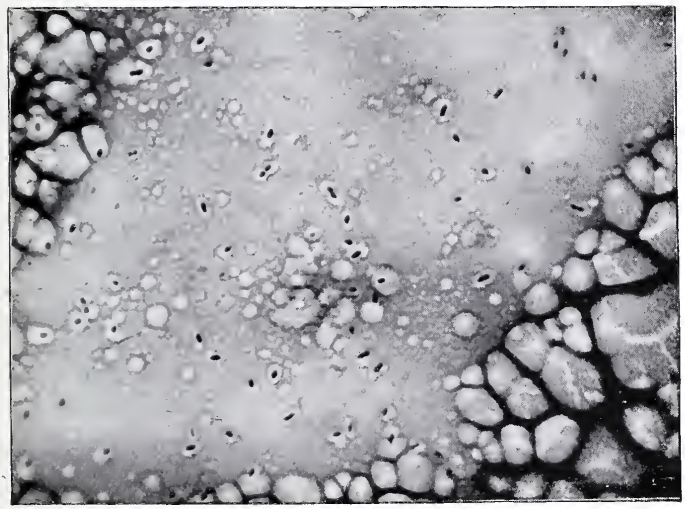
making of an enlarged negative or positive, but is by no means so simple.

Bacteriology also makes extensive use of photography in taking the various cultures in the gross, and colonies and individual bacteria magnified through the microscope. The foregoing applications of photography are mainly used as records or as illustrations for works or articles treating of the different branches mentioned; there is still another direction in which photography is beginning to be largely used in medicine, namely, in teaching. It is slowly but surely supplanting the familiar diagrammatic charts so generally used in instructing, as professors and teachers are realizing that a well-made series of lantern slides convey a far more accurate idea than the charts, and if the subject is well selected, show the special points that the charts were supposed alone to bring out. In this way it is now being applied to the teaching of human and comparative anatomy, general pathological medicine, bacteriology and the pathology and histology of the brain and spinal cord. Having made this slight mention of some of the applications of photography in medicine, it may be well to give a few brief illustrations of what are the best ways of working. The photographer who is not a physician will find himself very badly handicapped sometimes in attempting to bring out



By Ed. Leaming.
Inner surface of stomach of calf taken under water to show the Villi. Magnified and reduced.

just what the physician wants, and also the physician who attempts photography without the previous necessary training is apt to make a sad mess of it. Suppose we take a brain as an example: this is sometimes a very difficult object to picture, for several reasons; it is naturally of a soft and yielding texture, and covered with a thin, highly reflecting membrane, so that it is almost impossible to obtain a picture without those white patches of reflected light that are so disagreeable. The best way to take such a brain is to face the light with the camera and photograph the shadowed

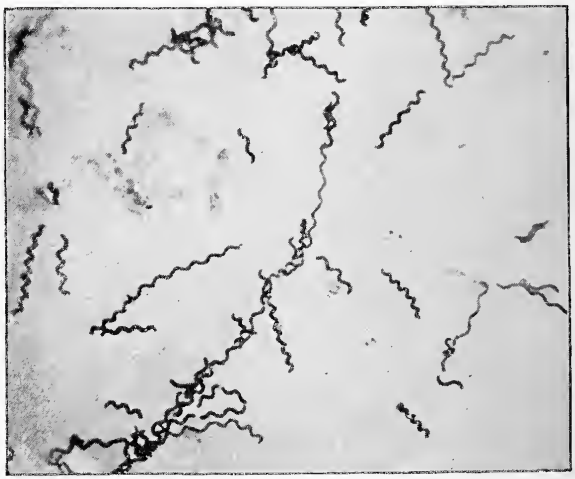


By Ed. Leaming.

Pneumococcus—or Diplococcus Pneumoniæ Capsulatus—stained blue and pink. × 1100 diameters. From preparation by Dr. T. M. Cheesman.

side, taking care, of course, that the cut section or special portion that you wish to depict is on the shadowed side, and excluding all side light. After putting the brain in position, time must be allowed for it to assume a state of complete rest, as it is not a very solid body, and a portion may move during the exposure, the rest remaining still. In preserving the brain various methods are in use, depending on what is desired to be done with it in the future. If for microscopical study Müller's fluid, consisting mainly of bichromate of

potash is often used; this stains the tissue a bright yellow, in which stage it is difficult to photograph even with color screen and the isochromatic plate, but in the course of time it will become brown and finally an olive-green color, when it will be found to be comparatively hard and will photograph easily. If the brain should be preserved in alcohol there is no trouble in taking it, as it remains white. The glistening membrane before spoken of is usually taken off before the brain is put into the hardening fluid. As regards background, use plain ones only, and those that will give the



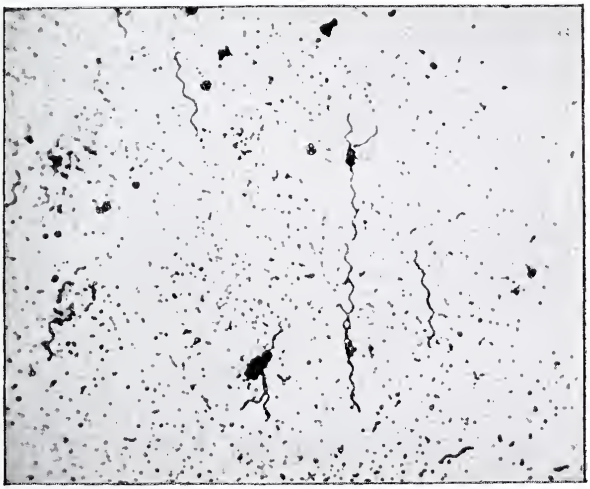
By Ed. Leaming.

Spirillum rubrum—stained black. × 1000 diameters.

greatest contrast with the subject are, generally speaking, the best.

Other pathological specimens are taken in the same way. It is sometimes necessary to take them with the camera placed directly above them; this is a very convenient way in many instances, especially when the object has to be kept in fluid. In photo-micrography so much depends on what has been done before the photograph comes to be taken that in order that the best results may be obtained, regard should be had to the methods of hardening, section cutting and

staining, with a view to the final reproduction of the specimen by the camera. The most important is the section cutting, which in turn depends on good hardening. The sections should be cut very thin and very evenly, for, unless they are, a good photo-micrograph of even moderate magnification will be an impossibility. The staining is such a complex matter, their being so many stains in use, that it would be impossible to discuss them all. Haematoxylin and eosin are very generally in use, and usually photograph well with color screen and isochromatic plates. Sometimes eosin refuses to



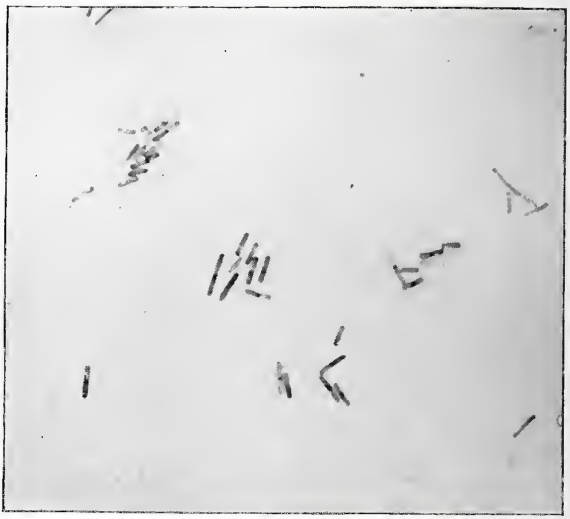
By Ed. Leaming.

Bacillus Typhosus—stained red to show flagella. × 1100 diameters. From preparation by Dr. T. M. Cheesman.

photograph well. I have never found why, but I suppose there may be differences in the different samples of the dye. The specimens should be well stained, slightly darker than would be desired for general view work with the microscope, and they should be mounted most carefully, so that they lie perfectly flat and even. It is sometimes well to dissolve in oil of cloves the celloidin in which the specimen has been embedded, that being now used more than any other embedding medium for general work, as it often gives the field a granular appearance that is undesirable; this, however,

makes the section very much more difficult to handle and mount properly.

Bacteria are generally difficult to photograph, as the standard magnification very generally adopted is one thousand diameters—that is, as has been aptly said, a man magnified the same amount would be as high as Mount Washington, and the slightest jar or movement of lens or object will cause the image to entirely disappear—a movement of $\frac{1}{1000}$ of an inch of the object will cause the image to move



By Ed. Leaming.

Bacillus Subtilis, involution forms—stained black. × 1000 diameters.

an inch—this being the case the matter of focusing becomes quite an art, and there are many devices in use to facilitate it. Much depends on the staining of the bacteria, some stains refusing to give clear-cut contrasting images, especially when faded—and as most of the stains are aniline dyes, they generally do fade in time. To accomplish good results in this line, nothing but the best will do, both as regards specimens and apparatus, and even when these are at hand it will sometimes be only by long and patient trial that you produce a satisfactory negative.

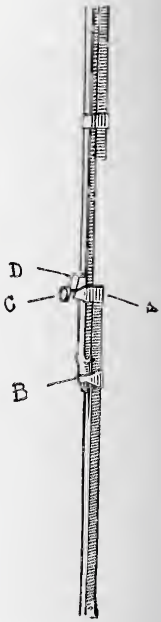
Photo by W. B. Post.

OFF FIRE ISLAND.

ATTACHMENT FOR LENGTHENING THE SCOVILL EXTENSION TRIPOD.

BY R. EICKEMEYER, JR.

THE cut shows a handy device for lengthening out a tripod of the above make, and illustrates the device so clearly, that it needs but little explanation.



It would seem to be rather better finished than necessary, but I was desirous of carrying out the general neat appearance of the apparatus that it was made a part of.

The wood used was chestnut, shellaced. The spike of the tripod is put through the brass strap A, and fits into a hole in the brass piece, B. The extension is then held in place by tightening the brass piece D by screw C. The piece D is spring brass and is a permanent fixture, otherwise it might become lost or mislaid. This might be dispensed with, but it prevents cutting of the tripod by the screw.

The device was designed as an aid for photographing from a canoe in places where the best points were those just a little way from shore, and where the water was too deep and the river bed too marshy to enable me to use the camera with the regular tripod.

WHICH ROAD? By Jesse Poundstone.

By Alfred Stern.

SUNSET.

A CHEAP COPYING STAND.

BY G. WATMOUGH WEBSTER, F.C.S.

IN *The Photo. Times* for March 30, 1894, I gave a description of a stand that, in times gone by, I had found very useful for copying; and it occurs to me that a fuller description with illustrations would be suitable for the pages of this Almanac. I may premise that the stand I describe was made by a working joiner, so that there was no expense incurred beyond that for wood and workman's time. The stand is capable of being used for either copying by reflected or enlarging (or reducing) by transmitted light. The illustrations will almost be self-explanatory so that little beyond diagrammatic instructions will be needed. For those unaccustomed to the work I may say that, where choice is possible, a camera should be chosen which focuses from the back; for, when photographing an object to its own size, the very slightest alteration of the position of the lens makes a very considerable difference in the size of the image. When enlarging, this difference becomes so great as to render front focusing practically impossible. For this class of work, where an exact size or proportion has to be worked to, the great difficulty lies in the adjustment of the object to the exact distance from the lens necessary; and as I have before pointed out, the work is greatly facilitated by being able to move the object to and fro, rather than the camera. A long camera-tailboard under the chin is troublesome enough at the best; far more is it if, to get the right distance between

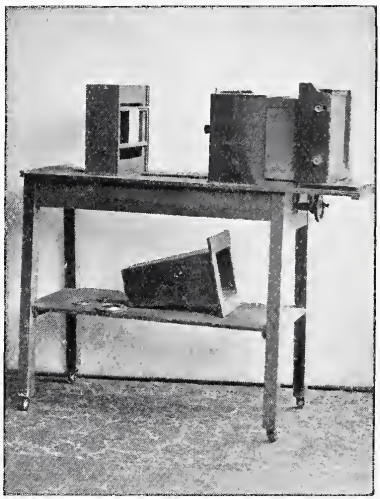


FIG. 1.

lens and object, the camera has to be moved forward on the table top, and thus leave a space of table beyond the tail-board. Few arrangements could be found more troublesome.

It will be understood that these stands are not suggested as being the best form possible for transparency work; they simply form a useful and convenient arrangement for keeping at hand in the studio, and doing the occasional copying that falls to the lot of every professional. For my own enlarging by transmitted light I have long used with advantage a special room, so arranged that in effect I work inside the eamera coating and sensitizing the plates there, and so forth.

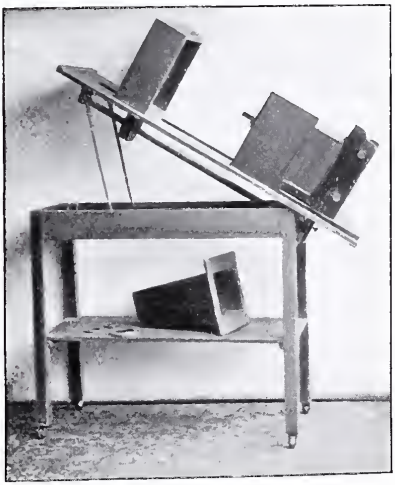


Fig. 2.

Fig. 1 represents the stand fixed for copying a print. This is placed on the front of the open box which is quite loose, fitting in its place by means of four wooden pegs attached to the sliding piece, and which slip into four apertures boxed in the base of the box. I have tried various modes of holding the object, and I find my assistants prefer the elementary one illustrated—two very slightly grooved horizontal sliding pieces holding the print between them and kept in position by two pins below the lower of the two. A mark is placed at the top and at the side, so as to indicate the exact centre opposite the axis of the lens. The camera is kept pressed against a slight wooden rib at the end of the table, and thus is always square to the object, and always in the right position. A wooden screw arranged and worked like a dining table screw is fixed below the table and screwed to it is a movable piece whose upper face is flush with the table top, and slides to and from the operator in the grooved sides of

a longitudinal aperture reaching from table end to camera front. By moving the wheel that is seen under the camera-back the screw is turned one way or the other and brings the object nearer to or further away as required. This table top is hinged at the camera end so as to permit the object to be raised, as shown in Fig. 2, to such height as may be required, so as to point it at the skylight and the open sky. It will be seen supported by two legs, which when not in use are hinged downward and fall out of sight, resting on the table frame internally. They fit into slots so as to get any height required; these slots are shown in this photograph. When working with the negative or transparency so placed, the open box being screwed down to its support, it is desirable to cover the intervening space between lens and object by any handy piece of drapery. The mode of doing this is shown in Fig. 3. The cone shaped object is a loose front for enlarging when copying a print, etc., there is, however, no advantage in the conical shape and it is more costly to make. The loose adapters, etc., are left in so as to show the use of the shelf. I hope this little apparatus may be found by others as useful as it has been to me.

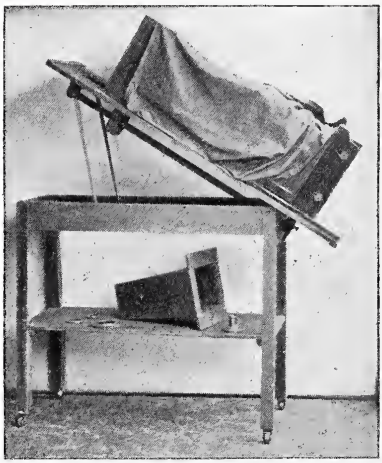


Fig. 3.

Levytype Co., Philadelphia. By S. Solovieff.

A COZY CORNER.

"PHOTO-DYEING."

BY ALFRED VILLAIN.

THE process which I present to you, based upon the transformation into a mordant by the action of light, of a salt of chromium associated with another metallic salt, gives positives on paper and tissues, in various tints at will, and which are permanent, resisting the action of light, acids and alkalies.

The process is not new, since Persoz, in 1857, and Kopp, in 1863, pointed out the affinity which certain dye-stuffs have for the oxides of chromium, but if the idea is not new, the results obtained may be so considered, for certain products which we employ were brought out only a few years ago, in fact some only a few months since, and so far as we know no one has thought of applying them industrially, and the colors which we obtain may be considered permanent, since the products which we use are the only ones which, up to the present, give fast colors on wool, cotton and silk.

The salt of chromium which is used gives a sensitiveness to the action of light which gives hope of being able eventually, by enlargement, either solar or by the lantern, to fix sufficient of the mordant for the production of curtains, tapestry, and upholstering stuffs which would be novelties.

The sensitizing bath is as follows:

Water	1000 c.cm.
Bichromate of potassium	30 grammes
Chromate of ammonium	10 grammes
Metavanadate of ammonium	4 grammes

A sheet of paper or a piece of cloth is dampened with this solution and dried at a low temperature, in the dark-room. The temperature must not exceed 25 deg. Centigrade, for at 30 deg. C. the transformation begins, and shows in the finished print by the coloring of the whites.

When dry the paper or cloth (after exposure under a negative, the exposure varying with the density of the negative, the quality of the light, etc., but which in any case is short), the print is removed, when all the details are strongly printed.

The print is thoroughly rinsed to remove completely all trace of the unfixed chromium salts.

In this condition the print can be dried and preserved, dampening it again in warm water when ready to dye it.

Several prints may be dyed at one time. The bath has a strength of 12 to 15 per cent., according to the weight of the cloth, and an excess of coloring matter does no harm.

The well-rinsed prints are placed in the dye, and the latter slowly brought to the boiling point, where it is kept for 15 or 20 minutes. The prints then are thoroughly rinsed, and if the whites are not pure the prints are passed through a warm bath of soap and carbonate of soda, or through a cold bath of chlorinated water, to which a few drops of hydrochloric acid has been added. After another rinsing the prints are complete. When chloride of lime is used it is necessary that all trace of chlorine should be eliminated by passing the prints through a slightly alkaline bath before they are dried.

The coloring matters which we advise are for the most part derivatives of anthracin.

The artificial alizarins are sold under the names of *alizarin violet*, *alizarin red*. The *alizarin violet* is an alizarate of sodium, and has for formula $C^{14}H^{6}(ONa)^{2}O^{2}H$.

The alizarin red is a mixture of *isopurpurin* and *flavopurpurin* with a larger or smaller proportion of alizarin. The alizarin violet gives a violet-red with mordants of chromium and aluminium, and blue-violet with iron. Alizarin red gives a more yellowish and brighter red with chromium and aluminium, and a duller violet with iron.

Alizarin blue S is a bisulphated preparation of alizarin blue or dioxyanthraquinonequinolin. This mark gives a tint similar to indigo blue; other marks give greenish-blue, violet-blue and violet-red.

Alizarin black S is a bisulphated preparation of naphtazarine or dioxynaphtoquinone.

Alazarin black R may contain a mixture of other alizarin colors.

Alizarin-cyanine black G (a new product) gives, like the two colors above, tints ranging from gray to intense black.

Purpurin ($C^{14}H^{8}O^{5}$) or trioxyanthraquinone gives an agreeable garnet tint.

Anthracin brown (*anthragallol*) gives tints varying from dark cream to dark chestnut.

Alizarin orange $C^{14}H^{7}(AzO^{2})O^{4}\beta$ mononitro-alizarin gives a beautiful orange tint.

Alizarin chestnut is doubtless a mixture of various alizarins (flavopurpurin, anthrapurpurin, purpurin and alizarin); it gives puce colored, purple or garnet tints.

Alizarin green S and *blue-indigo alizarin S* are transformations of *alizarin-blue* named above.

Alizarin cyanine R and *G* give tints ranging from violet-blue, blue and greenish-blue; with *galline*, handsome violet tints are obtained.

Ceruline S gives shades running from leaf-green to olive-green.

Galloflavine gives a greenish-yellow.

Alizarin yellow A gives a yellow with a more reddish tinge.

Certain products which we have mentioned may be mixed, and consequently we can produce a greatly varied scale of colors.

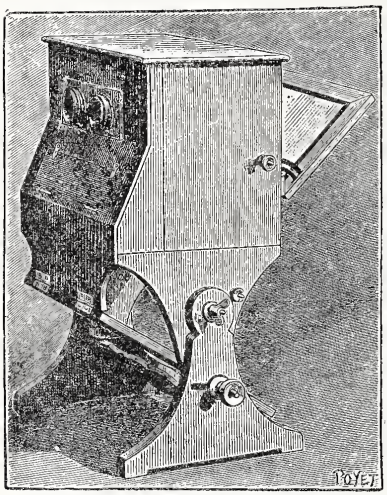
All the tints which we have described offer great resistance to the action of light, acids and alkalies. These different products do not fix except where the mordant has been impressed by the exposure; it is therefore certain that those parts unacted upon by the light will give pure whites, at least unless impure materials have been used, or the operator has committed some blunder, or unless the paper or cloth has been dried at too high a temperature or in the presence of white light. And, again, the elimination of the unfixed mordant must be complete. The quality of the tissue or paper has a great effect upon the beauty of the results, for these products fix under the action of mordants of aluminium, iron, copper and other metallic substances, and give various tints according to the metal present.

The possible applications of the process are numerous. The amateur can obtain prints on paper in various colors, or on cloth for faney articles, fire screens, sachets, *bonbonnières*, curtains, shades, table linen, enlargements of landscapes, marine views, etc. The process is very simple and inexpensive; 10 francs, or $2, will cover the cost of making 1,500 to 2,000 prints 5 x 7, of course not including the cloth or paper support.

APPLICATIONS OF THE STEREOCHROMOSCOPE TO THE ARTS AND SCIENCES.

BY LÉON VIDAL,
Professor of the National School of Decorative Arts, Paris.

THE stereochromoscope is an instrument invented by the optician, C. Nachet, by the aid of which we can see objects with their true relief and in their natural colors. Herewith we give interior and exterior views of this apparatus. The three positives are obtained by the method of photographic selection, already well known, by which are selected from the original polychrome subject the three principal colors or combinations of colors. The stereochromoscope serves for the synthesis of the colors, of which the positives are the analyses, through the interposition between the positives and the source of illumination of suitably colored mediums, one red, another green, and the third blue.



EXTERIOR OF STEREOCHROMOSCOPE.

These three colors must be complementary, as the combinations of the rays passing through the three should produce pure white.

The mirror, M, placed in front of one of the two oculars, serves for the fusion of the two positives, one placed opposite this ocular, the other below it.

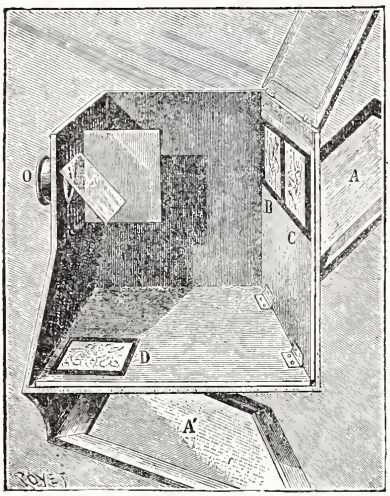
The eye sees only a single image resulting from the fusion of the two, and as one is illuminated by red rays and the other by green rays, there is a combination of these colors giving the reds, yellows and greens, as well as white and black.

Opposite the other ocular is placed the third positive,

having the proper stereographic differences in regard to point of view, etc., in regard to the one placed symmetrically with it, usual in stereoscopic pictures, by which means the necessary stereoscopic relief is obtained through superposition of this image on the other two. Moreover, it is illuminated through a blue screen. There is, therefore, a combination of these blue rays with the red and green of the other two positives, and the observer sees only a single image in relief and in its proper colors.

For fuller details relative to the stereochromoscope the reader is referred to *La Nature*, for July 7, 1894.

It is easily seen that such an instrument may be capable of numerous artistic and scientific applications. In the first place it will serve to prove the correctness or erroneousness of an analysis—for example, we may begin by reproducing the spectrum. This done and the three positives being introduced into the stereochromoscope, it will be seen immediately whether the original scale of colors is reproduced, or whether the stereochromoscopic image is wanting in certain points.



INTERIOR OF STEREOCHROMOSCOPE.

For best success, a scale of three colors only—red, yellow and blue, should be taken to commence with, then after having obtained a satisfactory result, to these three colors add a fourth, say green, afterward violet, then indigo, then orange. Working thus on these seven elements, choosing a medium shade, we would eventually be perfect masters of the most complex analyses. Pursuing the subject more closely it would be necessary with this scale of colors, each reduced to a unity, to produce scales in which there would be, for example, three units of red, five of green, two of yellow, etc.

This elementary study would lead to a more perfect knowledge of the means of following closely the analytical reproduction of colors, and we would know if this reproduction can really be complete, or if there are difficulties which for the moment it is impossible to overcome.

The work accomplished in the study of the combination of colors, by Young, Helmholtz, Maxwell, and many others, has been based upon the employment of means of a nature altogether different, and often does not furnish the apparent proof of the demonstration.

In the present case this proof exists, or if it is not there, it is because the photographic analysis is at fault, and we should seek to render it more exact.

From this simple fact we see that this instrument, henceforth indispensable in all physical laboratories, may render most important services to optical science.

It is recognized that when the operations have been properly performed, the synthesis of the colors by the stereochromoscope is sufficiently close to the original.

Savants may use this property for the registering of a multitude of phenomena in which color plays an important rôle. In astronomy this is frequently the case, but it is especially in natural history, for animals, for plants and flowers, that it is important to reproduce the natural colors.

Thus the effect is totally modified, if instead of illuminating the positives with their normal or proper screens, we change the relative places of the latter. The decorator will be able to examine the diverse combinations of colors for the same design and to choose that which seems to him most suitable for his subject.

We can in an article necessarily limited only give a résumé of the many different uses to which this instrument can be put.

Note.—It will be said that the photochromoscope of Mr. Ives leads to the same results. This is exact. Nevertheless we believe that it is not endowed with the property of adding relief to the natural colors, and on the other hand we do not know whether it will be able to make its entry into current industry as easily as the stereochromoscope.

We have seen it only on paper, which does not permit us, while believing in its real value, to speak as if we had seen it and studied it closely. In any case, what we have said of the applications of the stereochromoscope may be applied equally to the photochromoscope.

COLOR SCREENS FOR COMPOSITE HELIOCHROMY.

BY F. E. IVES.

THE difference between merely making colored pictures and making true reproductions of the colors of nature would appear to be a most important one. A few years ago it was well known that colored pictures could be made by composite heliochromy, but the possibility of making accurate reproductions, by means of three unretouched negatives, had not been proved, and was generally discredited. Writers like Vogel and Vidal thought that a greater number of negatives would be required, and Vidal held that, in any case, retouching would have to be resorted to.

That true reproductions are obtained by the photo-chromoscope system is no longer open to reasonable doubt, since the Photographic Society and Franklin Institute have indorsed the claim after submitting the method to severe tests, and men like Abney and Eder have expressed their approval. But, strange to say, while almost everybody formerly doubted even the possibility, many now go to the opposite extreme and assert that ordinary colored glasses, or screens adjusted to quite different color curves, will do well enough, if not even better, than those which achieved the first real success.

Not that these people have been able to show any successful reproductions of test subjects made with such screens as they would recommend, for in no single instance have they done so. Nor does it appear to matter to them that the recognized highest authority on color measurement and mixture has declared that the procedure that actually stood the tests is in accordance with the latest and most careful physical laboratory measurements of color mixtures, and that, reasoning from first principles, it is the only one which could be expected to yield accurate results.

As those who asserted that no accurate reproduction of the colors of nature was possible by means of three unretouched negatives were shown to be in error, not alone by argument, but by practical demonstration under test conditions, so will the errors of these others be proved against

them in due time. As a commencement, the writer will now undertake to explain a little more in detail than heretofore the application of "color curves" to the testing of color screens, and point out the effect of adopting curves different from those which form the basis of the photochromoscope procedure.

The first "color curves" were those of Helmholtz, representing no actual tests or measurements of color mixtures, but a very rough estimate of the relative effect of the different spectrum rays upon the three kinds of nerve fibrils which Young and Helmholtz believed to produce fundamental color sensations.

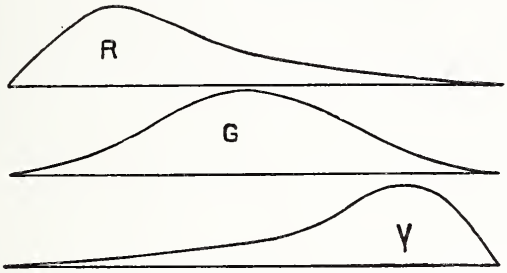
Second in order come Maxwell's, the result of actual measurements of mixtures of the three spectrum colors, which he had some reason to believe excited exclusively fundamental color sensations.

Third in order come Abney's, which are similar to Maxwell's, but more accurate because he used red and violet rays of greater purity in making his mixtures, and an eyepiece which gave a larger image on the retina. His daylight curves, the only ones directly comparable to Maxwell's, have not yet been published. The writer has modified Maxwell's curves in accordance with Abney's suggestions, for his own purpose, but will not assume the responsibility to publish the modification, because he has been informed that Abney's own drawings will be published in this year's Royal Institution proceedings.

Fourth, and last, come Kœnig's, which are not the direct result of measurements of color mixtures, but are arrived at by a somewhat complicated procedure, based partly upon data obtained by experiments on color-blind subjects. Much of the difference between this diagram and Maxwell's is more apparent than real, being due to the fact that it represents a normal spectrum, compressed at the violet end and expanded at the red end as compared with the prismatic spectrum. Redrawn on the scale of the prismatic spectrum, the most important difference between this diagram and Maxwell's would be in the curve of the red sensation, which instead of stopping at the E line in the green, is

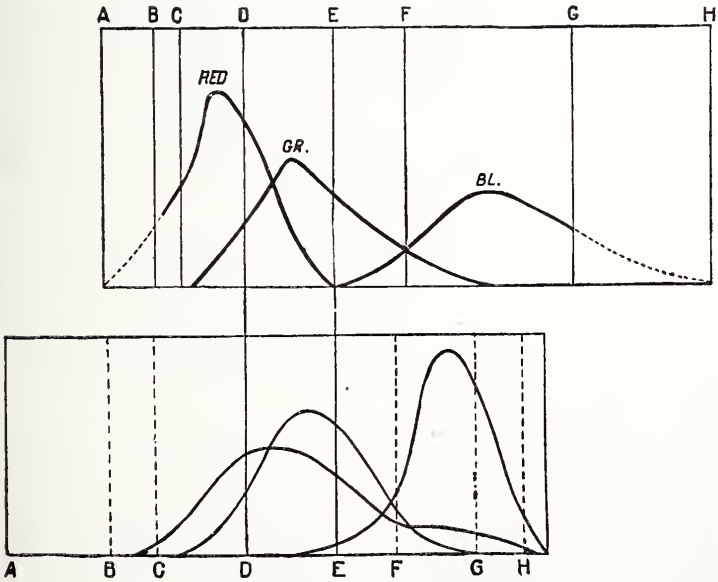
seven-twelfths as high at that point as the curve of the green sensation, and extends even into the violet. This

HELMHOLTZ'S COLOR CURVES.



difference is a most important one. Kœnig's diagram is also misleading in making the visible spectrum appear to

MAXWELL'S COLOR CURVES.



KŒNIG'S COLOR CURVES.

end in the red above B, which it is well-known is not the case.

The writer's original plan in composite heliochromy was

to find three simple spectrum colors and three dyes or transparent pigments, either of which when mixed or superimposed in suitable proportions would "counterfeit" (produce the physiological effect) of any color in nature; and by testing the color screens by photographing the spectrum, to arrive at a definite means of securing correct mixtures of the simple colors in the reproductions. This idea was made perfectly definite and practicable by the discovery that Maxwell, in his researches tending to prove the Young and Helmholtz theory of color vision, had made, by means of a very ingenious original optical device, just such measurements of color mixtures as this plan called for. It was only necessary to accept Maxwell's statement that red, green and blue (violet) were the spectrum colors that would mix to reproduce all others, and to prove the color screens by making photographs of the prismatic sun spectrum showing density curves corresponding to the curves of Maxwell's diagram, in order to obtain satisfactory reproductions of natural colors by the process, as shown in 1888. Afterward, by modifying Maxwell's curves in accordance with Abney's suggestions, the process became so accurate as to stand the most severe tests that a committee appointed by the Franklin Institute succeeded in providing.

Now, however, comes the suggestion, from one who is no less than a F.R.S., that, since Kœnig's curves are more nearly "correct" than Maxwell's, with which the writer succeeded, therefore, there is great latitude in the selection of color screens for this work. The inference is that as good, or better, results should be obtained with screens proved according to Kœnig's color curves.

By showing that this opinion is without foundation in fact, and that the adoption of Kœnig's curves for this purpose would introduce a fatal defect in the process, the writer hopes to do something toward stemming the tide of reckless assertion, which is discrediting an important achievement.

First, as to the reason. There are three spectrum colors, and only three, that can be mixed to reproduce all others. Therefore, in practice, we can only deal with mixtures of these three colors when we wish to reproduce others. Max-

well's and Abney's color curves represent measurements of mixtures of these three colors, with slight differences as to the hue of the red and violet. *Kœnig's curves do not represent mixtures of three spectrum colors, but mixtures of red and violet, with a fundamental sensation which nothing in the spectrum represents, and which, therefore, cannot be optically mixed with other colors, as required in composite heliochromy.*

Second, as to the consequence of employing color screens proved according to Kœnig's curves. Take, for instance, the green of the spectrum at Fraunhofer line E, and suppose that we wish to reproduce it. Now, since this is one of our reproduction colors, it should only act in the negative belonging to that reproduction color. Reference to the diagram will show, however, that with screens proved according to Kœnig's curves, the action of the purest spectrum green would be seven-twelfths as great in the negative belonging to the red as in the negative belonging to the green, and that, therefore, the purest spectrum green would be degraded by the admixture of that great proportion of red in the reproduction—*a fatal defect.*

Apply the same test to Helmholtz's diagram, and it will be seen that both red and violet light will be mixed with the green in the reproduction, the sum of the two being equal to two-thirds of the green—again a fatal defect.

Now apply the test to Maxwell's diagram, and it will be seen that the green at E will act only in the negative belonging to that green, and that, therefore, there will be no degradation by admixture of either red or violet in the reproduction. So, also, for all of the compound colors; actual measurements will show that screens proved according to Maxwell's diagram must secure substantially correct reproductions. Abney's measurements show that every color but blue-green can be reproduced in its full purity and intensity and that even in the blue-green the degradation is equivalent only to the admixture of a very small amount of white.

The obvious conclusion is, that although the Maxwell-Abney color curves do not, in one sense, exactly represent the Young-Helmholtz theory of color vision as now understood, they are the only ones available for our purpose, which

is, to reproduce all other colors by mixtures of three. This is not a new observation, the fact having been pointed out by the writer in the "Hand-Book to the Photochromoscope," (p. 14), in January last.

Reference to diagrams representing the density curves obtained by photographing the spectrum through "red, green and violet glasses," on "ordinary plates," etc., would readily show the impossibility of obtaining accurate color reproductions by such means, but this article is already a long one, and "a word to the wise is sufficient."

It must also be admitted that what is proved to be true for the photochromoscope process is equally true for three-color printing, not only because the argument works out in the same way when applied to the appropriate "printing colors," but because the most beautiful and accurate three-color prints yet produced (examples of which are always on exhibition at the writer's home in Philadelphia) were made from photochromoscope negatives.

SIMPLIFIED MICROPHOTOGRAPHY.

BY HON. A. A. ADEE.

WHILE the attainment of the highest results in microscopic photography demands signal proficiency and an outlay running far into the hundreds, any possessor of a fairly good compound microscope and a small camera can produce pictures at once interesting and meritorious. It is a mistake to suppose that an elaborate stand with modern apochromatic objectives and illumination by heliostat or calcium light is requisite, except for the most advanced bacteriological and diatomic work. Indeed, it would be a positive drawback to the mere amusement seeker to have so expensive an outfit, for he must needs undergo a year or two of professional tuition or wasted experiment before reaching critical success.

I long shared the general belief and postponed any essays in this tempting direction until I could get an eight hun-

dred dollar apparatus, thereby missing several winters of singularly interesting pastime. Having a good Nachet stand with mechanical stage and a well selected set of objectives, and also a discarded 4 x 5 camera, it at last occurred to me to put them together and try conclusions therewith. A stout base-board, four feet long and six inches wide, slotted along the middle and set on turned four-inch legs, gave a good beginning. To this five suitable blocks of wood were fitted, each having a screw-pin passing through the basal slot and fastening by a thumb-nut. To the rearmost block the camera was pivoted, a paste-board funnel with black velvet lining being attached to the front, so as to allow some two feet draw. To the next block the microscope was firmly clamped, the eye-piece being, of course, removed, and the open tube being joined to the little end of the funnel by a light-tight sleeve of velvet. The third bore a big bull's-eye condenser, and the fourth a heat and light filter. The heat filter gave a world of trouble, but a six-inch ring cut out of half-inch all-rubber steam-packing, with plates of stout glass generously cemented to each side by means of a paste of red lead and gold size, supplied a water-tight cell, a hole being bored in the rubber wall to admit of filling it. A flat-sided pocket flask of clear glass, holding half a pint, was afterward found to do nearly as well. It should be filled with a strong (40 per cent.) solution of copper *nitrate*, to which a grain of chromic acid is added, giving a practically monochromatic blue-green light that does not call for the long lamplight exposure needed by the yellower liquid usually employed for modifying direct sunlight. One can't get along without a heat-absorbing cell, even if it only contains pure water; if it be omitted the warmth of the condensed lamp rays will often melt and ruin a balsam-mounted slide, or, at least, cause it to run, thereby shifting the object and yielding a panoramic effect, which is disheartening in a negative. On the last block came the lamp, a common, low-bodied kerosene hand-lamp, with a two-inch flat wick and a roomy chimney of the Rochester pattern. It was set with the edge of the flame toward the microscope, and the inside of the chimney away from the flame, was coated with a round patch of smoke

from a wax gas taper, so as to avoid reflection. A reflector behind the source of light ought not to be used, for the beam is thereby so broken up as to throw a distorted pencil, and what is gained in light is lost in definition. Care was taken to so adjust the thickness of each supporting block that the optical axis of the whole system ran truly from the flame, through the tube of the microscope, to the focusing screen. To the centre of the latter, on the ground side, a one-inch cover circle was cemented with balsam in order to focus the image on the transparent spot by means of a set lens.

Proper illumination is the most difficult thing to obtain, and withal the most indispensable. An unmixed ray from the edge of the flame, passing perpendicularly through the filter-cell and evenly converged on the object by a good bull's eye with the flat side turned toward the stage of the microscope, will give a large, level field of well-focused definition. A broken ray, full of cross refractions and unevenly condensed, shows only a small patch of moderate sharpness, and even in that, spectral diffraction borders are apt to appear. These ghosts will sometimes spoil an otherwise perfect negative when the flame wavers in a draught. A "critically" disposed light is surprisingly different in its effects from one "uncritically" adjusted. The minute hairs on a house-fly's wing afford a simple test—under a quarter-inch objective, if badly lighted, they show double points diverging from their base.

The fine adjustment of the microscope must be attached to some adequate contrivance so as to be readily operated while the observer stands before the ground-glass screen. A side-rod, with milled head at the hither end and a pulley wheel at the other, from which a thread band passes over the milled head of the micrometer screw, is pretty, but bothersome to apply, and not as sensitive to manipulate when the higher powers are employed as is the more primitive device of a stout thread with a weight at each extremity. This is waxed in the middle where it runs over the micrometer head, and thence passes through guide rings at the sides of the general base-board to the operator's hands, where the weights hang right and left, convenient to the slightest touch.

This inexpensive apparatus permits of really excellent photographs of thin sections being taken with objectives of from two inches to one-third inch focus. The resultant magnification depends, obviously, on the distance of the screen from the objective. I find thirty inches a favorable length, as it gives a circle of nearly four inches. If a greater distance be essayed, the light will be correspondingly diminished and longer exposures required, while the gain in amplification is balanced by some loss of sharpness.

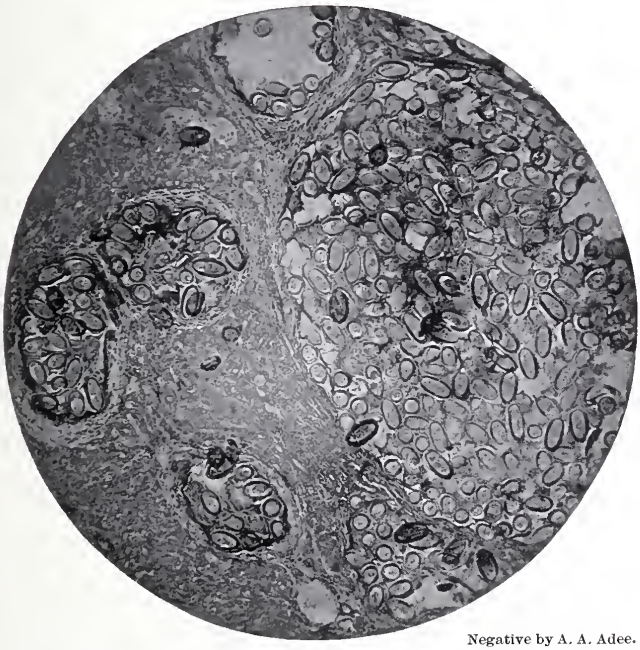
For the higher powers, one quarter to one-eighth inch, a good substage condenser should be used on the microscope itself, and the bull's eye discarded. The common non-achromatic Abbe condenser works fairly well, especially if the angle of the illuminant cone be diminished by removing the smaller top-lens of the combination; but for "critical" work an achromatic Abbe must be used. With its employment, however, as with marriage according to the old rhyme, one's trouble begins, for it will not do its best unless the pencil of light impinging on its lower face be practically parallel. How to get a straight ray of strong lamp-light is a problem which the makers have not yet volunteered to solve satisfactorily, but it should not be a hard one. Sunlight and a calcium burner, both of which throw parallel rays, being out of the question for me, I have taken a powerful projection lantern and set it as near to the microscope as the intervening heat-filter will permit. As the beam from its projection-lens is a divergent cone, I necessarily lose the greater part of the emitted light, but that which follows the axial centre (no bull's eye being used) proves sufficient for my needs, and the achromatic Abbe condenser does the rest. What I want is a substitute lantern-objective which will collect all the light from the four-and-a-half-inch condenser and project it in a parallel ray about an inch in diameter upon the base of the Abbe.

Equally with correct illumination, a good objective is essential to creditable work. One of the very best I have is a Bausch & Lomb half-inch with an iris diaphragm set in its tube between the two combinations. Another excellent glass is a Reichert 8-millimeter "half-apochromat," which

shows a larger and flatter field than the full apochromats, giving at 31 inches sharp four-inch circles with a magnification of 100 diameters. There is no occasion for the mere amateur to spend a small fortune on the high-priced apochromats, since almost any first-class achromat of reputable American or English make will do the business as well, even though not especially corrected for photography. Besides being, from the peculiarities of construction, liable to mishap or deterioration, the apochromat field is purposely smaller and less flat, needing compensation by a specially computed eye-piece; and they work slower. Having an excessive numerical aperture, their working distance is narrow and with a conjugate focus of 30 inches to the screen the frontal focus is inversely lessened, so that only the thinnest covers can be made use of with the highest powers. They do their best, and very good it is too, with the aid of expressly constructed "projection oculars," which flatten the field besides lengthening the working-distance—but this entails such diminution of light as to make accurate focusing difficult by the comparatively feeble rays of a lamp.

Assuming that the power of the objective, the strength of the illumination and the angle of the beam converged on the object are in perfect correlation, the management of the substage diaphragm becomes important. If too widely open the image on the screen lacks contrast and it is hard to get a satisfactory focus. By gradually closing the diaphragm, which ought to be of the iris pattern, a point is reached affording marked contrast. To get the right focus it does not suffice to see the object generally well defined—its color becomes a potent aid to the average achromat in order that it may exert its best actinic effect upon the sensitive plate. Remembering that the residual secondary spectrum is usually a palish green in most modern objectives, some delicate transparent detail of the object should be chosen, such as a fine bristle or beaded marking, and the micrometer adjustment be manipulated until a tinge is seen on the border line between green and rose. After this actinic focus is secured, I find it does good to still further slightly reduce the aperture of the diaphragm if the light be strong.

In photographing the interesting details of insect and vegetable anatomy, three objectives are advisable, one of one and-a-half or two inch focus, one of three-quarters, and a third of one-quarter. Being used without an eye-piece, preference may be given to objectives corrected for the American or English tube length rather than the short continental standard, for the lens is less strained when its conjugate focus is stretched to 30 inches. To these three



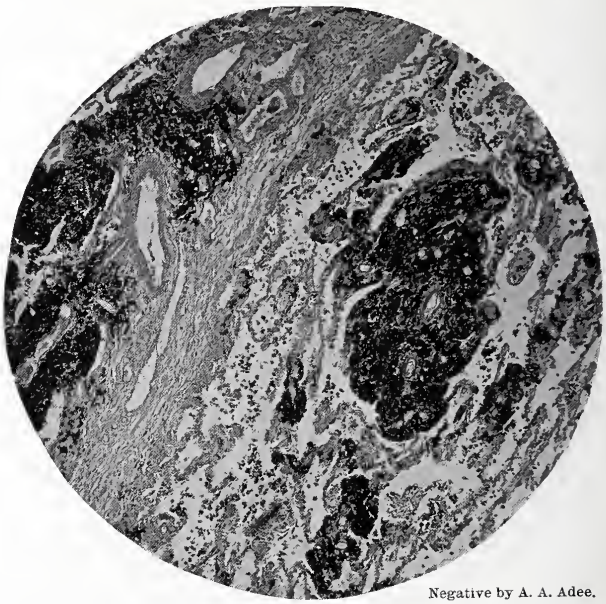
Negative by A. A. Adee.

Liver of Mouse, Eggs of Tricocephalus. × 100. Reichert, 8mm.

may be added a good one-fifth or one-sixth if an achromatic substage condenser is to be used therewith. It is best to leave the higher immersion powers to the experts with their heliostats, lime-lights or 2,000-candle arcs at command, inasmuch as kerosene falls short of its duty in the premises, and even if a satisfactory focus can be obtained an hour's exposure is wearisome.

Subjects for successful photographing should be thin,

level, and not too dark in color. Very thin sections are the best of all, but such delicate objects as the foot of a small spider, the feathery paddles of the *notonecta*—those tiny beetle-like creatures that affect stagnant pools and have a habit of swimming upside down—the mouth parts of a mosquito, or the scales of a moth come up nicely. In microphotography there is practically no "depth of focus," so that thinness and planeness are imperative. For my part I have



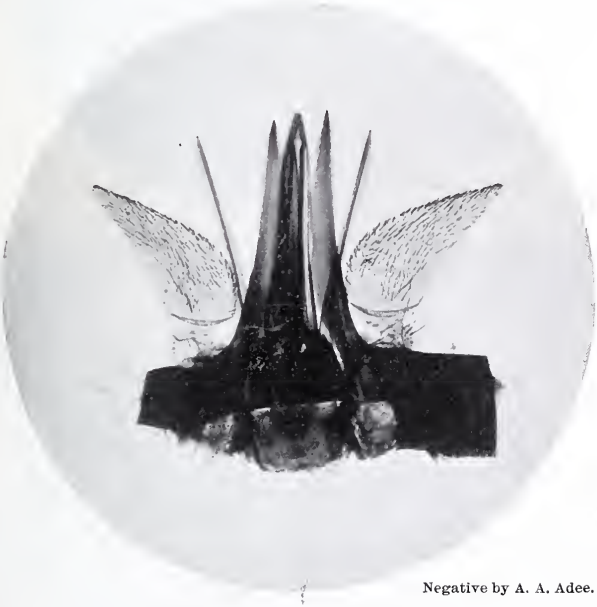
Negative by A. A. Adee.

Anthracosis of Lung. × 40. Bausch & Lomb, ¾-inch, Series II.

taken a fancy to pathological horrors, and the Army Medical Museum has furnished me with many enticing sections of cancers, tumors and similar degenerated tissues. The editor of the ANNUAL has kindly reproduced a few of my pictures to illustrate this paper. One shows the liver of a mouse, invaded by a singular parasite, the *tricocephalus*, which lays a multitude of eggs in the hepatic substance. Another gives an idea of the curious pulmonary complaint, anthracosis, which attacks miners when their lungs become choked with

the fine anthracite dust. A kindred disease is found among the dry grinders of Sheffield. For these two excellent preparations I am indebted to my good friend Dr. W. M. Gray. The view of the lances of the common blow-fly illustrates how critical lighting brings out the slender hairs.

I have dwelt so strongly on the imperativness of securing this "critical" illumination if good results are aimed at, that it may be fitting to close this already too long paper



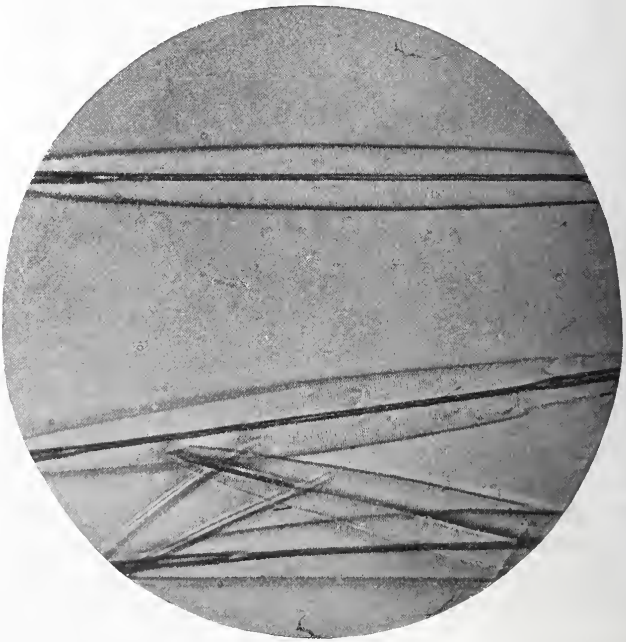
Negative by A. A. Adee.

Lances of Blowfly. × 14. Hartnack, 2 inches.

with a comparison of the microphotography of a quarter of a century ago with that of our own day, and to this end the editor has generously reproduced two prints of the same object, it being that extremely difficult diatom, *Amphipleura pellucida*, the markings of which are but 1.100 thousandth of an inch apart, and so faint as only to be revealed by the most powerful objectives under the best eonditions of oblique illumination. The late Dr. Woodward was, I believe, the first observer to photograph, in 1871, this exasper-

Negative by Dr. J. J. Woodward, U. S. Army, January, 1871.

Amphipleura Pellucida. × 1240. Powell & Lealand, $\frac{1}{16}$th water-immersion front



Negative by Dr. H. J. Ditmers, 1893.

Amphipleura Pellucida. × 1240. Queen, $\frac{1}{15}$th oil-immersion.

ating test-object which so few microscopists have really *seen.* Faulty lighting, apparently, has crowded the field with diffraction spectra. That these were not due to imperfection of the Powell & Lealand 1/16th water immersion objective he used is inferable from the clearness of the lines on the frustule proper. By the side of this old print is one taken last year by Dr. H. J. Detmers, with a Queen 1/15th oil immersion lens, in which the vexatious ghosts are wholly exorcised. The striking difference seems mainly due to the critical improvement in the achromatic condenser and in the more accurate regulation of the light rays.

The fascinating region of micrography deserves to be oftener explored by the amateur, and especially by those who, like myself, do not have much chance to work by daylight.

By H. W. Belknap.

ON THE BRONX.

SOME USES OF SIMPLE LENSES.

BY J. TRAILL TAYLOR.

By Jesse Poundstone.

THE FARMER'S BOY.

WHEN one has a good achromatic lens to start with, it is quite surprising what optical liberties may be taken with it without its showing itself to be the worse for it. I will explain what I mean by an illustration.

In my treatise *On the Optics of Photography and Photographic Lenses*, I said that the deep meniscus lent itself wonderfully to the construction of combinations intended to have an easy, accommodating elasticity of focus. A single achromatic of deep meniscus form, properly corrected for actinic achromatism, may have united with it, as a back combination, a lens formed of a single crown glass meniscus, which shall not only correct the distortion of figure necessarily caused when the former is used alone, but shall do so without any appreciable interference with its actinic correction. In other words, the achromatized front, used alone, has its chemical and visual coincident; yet, when a simple, non-achromatic crown glass meniscus is added to this, although there may be a diminishing of the focus to about one-half, the chemical and the visual foci are still practically coincident as before.

Advantage may be, and in my own case has been, taken of this property to have adapted to one achromatized front lens several simple back lenses, each of different focus from the other, thus securing a battery of good working objectives at a minimum of cost.

A further development of this idea has been effected by the insertion, *à la* Waterhouse diaphragm, of simple, uncor-

rected lenses (spectacle glasses) between the front and back of the ordinary rapid reetilinear. A well-known optical firm here in London has recently adapted some of these for one of our leading photographers, who has, by their agency, taken numerous fine views both at home and abroad, and he informs me that he would not now, on any account, be without them, for, by inserting one or the other strength, he can have any focus he desires within a considerable range.

It is more than two decades since I advocated piercing the mount of a lens with wide slots, so as to permit of the insertion of a rather long sliding piece of brass containing four apertures in a line and at suitable distances apart. In these were set thin lenses of different powers, the mechanical arrangement being such that any one of them could be brought quite central with the fixed lenses in the mount. The focal range I obtained by the agency of this convenient adapter extended from seven to fifteen inches, the intermediate ones being nine and twelve inches.

But I started this article with the idea of describing a very ingenious application of the principle recently made by one of our most eminent London opticians, Mr. Conrad Beck, of R. & J. Beck. It forms an addendum to the ingenious Frena hand camera, manufactured by this firm. This Frena is what is termed a fixed-focus camera, having a 5½ inch focus lens which, when diaphragmed down to *f*/16, renders everything sharp from 14 feet to infinity. Accompanying it is a tiny cabinet containing four single lenses of different foci, each set in a cell. If it is wished to take any object sharp at a nearer distance than 14 feet, the insertion of cell No. 1 brings within the scope of lenticular sharpness everything between 9 and 32 feet; No. 2 cell brings the range still nearer, or 6–10 feet ; No. 3, 4½–6 feet, while with No. 4 the range is 3½–4½ feet.

I think very highly of this method of Mr. Beck's for increasing a focal range of any camera which does not provide for racking the lens in or out, and although these adapting lenses are but simple, non-achromatized ones, they do not interfere with the definition obtained by the perfect lenses belonging normally to the camera.

PHOTOGRAPHY AND LAW AS TO COPYRIGHT.

BY WM. GEORGE OPPENHEIM, L.B., PH.D., MEMBER OF THE NEW YORK BAR.

FEW photographers apparently have any idea of the law relating to copyright.

1. In the sense of which "copyright"* is commonly understood, it comprehends, *First*, an exclusive right belonging to the author *before publication*, to make and multiply copies of a composition; that is, the right to publish or not, as he thinks fit, and to restrain others from publishing; it exists independently of positive law,—is a right of universal recognition, and, *Secondly*, the right, *after publication*, of republishing and of restraining others from doing so. The latter exists by statute. Both these matters are of the utmost importance to the progressive photographer, and the laws upon the subject should be carefully studied by him.

By Moreno.

COQUETRY.

* Although Atticus freely distributed copies of Cicero's letters it appears, from an allusion by Juvenal, that the property right in manuscript was recognized among the Romans; but before the art of printing the civil law knew nothing of literary property.

By Clinton Ogilvie.

IN THE ADIRONDACK FOREST.

2. Copyright* before publication is the right subsisting in the author or artist to the first publication of his work.

3. Common law copyright ends on publication.

4. Statutory copyright begins with publication.

5. A publication of the work, whether book or picture, with the author's or artist's assent, is an abandonment of his common law copyright. The work then becomes *publici juris*, and is open to any occupant.

By L. M. McCormick.

EVENING LIGHTS.

6. After publication with the author's or artist's consent all may copy and reproduce.

7. The same principle prevails in the law of patents.† If the inventor allows his machine to be used by the public, he abandons his right.

8. If common law copyright survive publication, then was there never occasion for any statutory protection.‡

9. It is only because the author's natural right expires

* The operation of these laws is to secure the author an exclusive use for a limited period that he may be stimulated to the production of works for the benefit of mankind. Humanity is concerned in whatever consolation art may draw from the inspiration of Scripture, poetry, painting, or the reproductive art sciences.

† Copyrights and patents do not stand on the same basis as to natural, exclusive right. A patent covers the idea or principle of an invention; copyright does not cover the author's idea, but only the language in which he clothes the idea; the difference is radical.

‡ It is a matter of history that the English act for the copyright of prints originated with Hogarth, who found no protection in the common law against the indiscriminate reproduction of his own works.

with publication that legislation is necessary to give him artificial privileges.

10. On the other hand, the copying of a picture and exposing the copies for general and indiscriminate sale, with the assent of the artist, is such a publication as makes the right to copy the original *publici juris*, is conceded by all authorities and questioned by none.

By Moreno.

WAITING.

11. But the thing in which an artist has copyright, is the conception and development of his ideas; and these it is the boast of photography and lithography exactly to reproduce.

12. The questions asked and the opinions requested are:

First: What is your construction or interpretation of the

By Jesse Poundstone.

"HERE COMES FATHER."

Amended Copyright Act, in force on and from July 1, 1891?

Second: What are the rights and duties of persons who produce photographs, photogravures, half-tones, chromos or engravings, or, in short, pictorial, or illustrations connected with the arts and sciences under said act?

A "PHOTOGRAPHIC TIMES" READER.

Third: How shall they procure copyright under this act?

In answer thereto, I beg to submit the following opinions:

1. The answer to these questions depends on the interpretation to be given to Section 4948 to Section 4970, both inclusive, of the Revised Statutes of the United States, in force December 1, 1893, as amended by the act approved June 18, 1874, and by the act approved March 3, 1891, and which took effect July 1, 1891.

The construction and interpretation of this copyright act are beset with great and peculiar difficulties arising from the illogical, unrhetorical and contradictory, or at least irreconcilable terms, in which the act was drawn and expressed.

With these considerations in mind I have endeavored to construe the act:

By Alfred Stern.

THE SENTINEL.

2. Under Section 4952 of the U. S. R. S. the author of a photograph is entitled to copyright it.

[*U. S. R. S., Section* 4952.]

3. Previous to the passage of this act, Section 4952, the right had been both questioned and denied; it had never been admitted.

4. It is now provided by Section 4956 of the Revised Statutes of the United States that no person shall be entitled to a copyright unless, on or before the day of publication in this or any foreign country, he shall deliver or mail to the Librarian of Congress *a printed copy* of the photograph, print or cut for which copyright is applied.

[*U. S. R. S., Section* 4956.]

5. Under Section 13 of the act, taking effect July 1, 1891, and which act now governs the whole subject of copyright, no person can obtain such a copyright except a citizen of the United States, or a citizen of the foreign State or Nation whose laws grant the citizens of the United States reciprocal rights under said act, or rights equal to those granted to the citizens of said States or Nations under their laws.

[*U. S. Stat., March* 3, 1891, *to take effect July* 1, 1893. *Sec.* 13.]

6. But such persons can obtain a copyright in this coun-

By A. L. Simpson.

LOADING.

try only on complying with the requirements of Section 4956 of said Statutes as amended as aforesaid.

7. But in case of a book, photograph, chromo or lithograph, the two printed copies above mentioned *shall be made from type set in the United States, &c.*, and in the case of photographs, *from negatives made in the United States* or *from transfers from negatives made in the United States.*

[*U. S. R. S., Section* 4956.]

From a careful consideration of the law and the Statutes, I am of the opinion:

(*a*) That the *two copies* required to be filed with the Librarian of Congress of negatives of photographs sought to be copyrighted must be of *negatives made* within the United States under Section 4956 *supra.*

(*b*) That the transfers therein mentioned, if negatives are not filed, must be from such *negatives made within the United States.*

[*Id., Sec.* 4956.]

8. The Librarian of Congress, however, construing another part of the same section, it seems, but probably inadvertently, takes a different view; in so doing, however, he misquotes the Statute; and even then his *obiter dictum*, if it can be raised to that dignity, does not affect the rights of photographers.

9. If the Statute is to receive a strict construction and to be enforced literally as its language implies, then the two copies to be mailed or filed with the Librarian of Congress must be produced from a negative made in the United States, or from transfers made from such negatives.

It is possible that a more liberal construction may be given to this Section 4956, holding that if said two copies are made from negatives made in the United States or *from transfers* made in the United States from such negatives (as is the construction given to the act by the Librarian of Congress) then a valid copyright may issue.

10. The Section in question (paragraph 3 of the Directions for Securing Copyright), this is supposed to be the work of the Librarian:

"Books must be printed from type set or plates made in

By Alfred Stieglitz.

A YOUNG GARIBALDI.

the United States; photographs from negatives made in the United States; chromos and lithographs from drawings on stone or transfers therefrom made in the United States."

11. According to the Librarian's *construction*, copyright might issue if the *transfers* were made in the United States.

I am inclined, however, to the opinion that the plain and literal construction of the Statute will prevail, viz.:

12. The negatives must be produced in the United States and the fact that *transfers* are made in the United States *will not avail.*

13. A subsequent Section provides for the prohibition of importations during the existence of such copyright, but

ON THE BEACH. By W. B. Post.

seems to give no protection whatsoever to copies made from "transfers" made therefrom.

14. By Section 4960 it is provided that a *failure* to *deliver* or *deposit* in the mail the copies mentioned in Section 4956 shall be punished by a fine of twenty-five dollars, though by that Section no copyright is acquired without such *delivery* or *deposit.*

This is getting very close to the border line of nonsense.

15. These discrepancies and contradictions are apparent on the face of the act, but it is difficult indeed, if not impos sible, to forecast what anomalous features the future may bring forth when this Statute is submitted to the crucial test of well-contested litigation and judicial construction.

(*a*) The foregoing opinion is based on the literal language of the Statute, which, of course, as a lawyer, I am bound to accept as I receive it, but this is only the rule of interpretation.

(*b*) This, however, does not preclude or prevent me from a critical consideration of the construction of the Statute, and I have added to my opinion a few remarks on that subject.

(*c*) I believe it to be illogical,* in its whole scope and effect, that it is loosely and inartistically drawn, and that it will not subserve the purpose for which it was intended and for which it was passed; so far is this true, that authorities on copyrights now advise their clients not to copyright plays; the reasons therefor are that decisions in the United States Court to the effect that the *performance* of a play is not *publication* and that therefore an unpublished play is protected by the Common Law, and not by the Copyright Acts, recognize the perpetual stage-right of any dramatist who will forego the doubtful profit of appearing in print.

16. Notwithstanding the important steps taken by Congress in the Copyright Act of 1891, we are sadly behind Continental Copyright legislation, in that the United States refuses to acknowledge the claims of American litterateurs and artists—such refusal is based upon a narrower conception of the property rights of authors and artists than that held by the legislation of Europe. Any restrictions of such claims is to obstruct the progress of letters, and to restrict the benign influences of art.

17. Why should Russia and France grant copyright during the life of the author and for fifty years thereafter, and copyright in the United States exist for a first term of only twenty-eight years, and an extension of such term of fourteen additional years, if at the expiration of the first term the author or the author's widow or children be living?

(*a*) Why should not a literary or artistic producer work

* Chromos, lithographs or photographs must, under the copyright law, be produced in the United States. This condition is not attached to the "more artistic" forms of reproduction, hence foreign artists control American copyright of engravings, or photogravures of their productions. That this works great injury to our American producers of the "more artistic forms," goes without saying.

for his grandchildren if he sees fit? Why not? It is a sad fact that Washington Irving was unable to insure for his nieces (his adopted children) the provision they were in need of, and which a continued copyright in their uncle's work would have secured them.

(*b*) Why should not such an important subject as copyright be submitted to a commission of experts, who shall make a thorough investigation of the whole copyright law, domestic, artistic, literary, musical and photo-mechanical? Why not?

(*c*) The report of such commission would undoubtedly be a basis for trustworthy legislation.

(*d*) Eleventh hour amendments, made at the suggestion of short-sighted trade unions and concurred in by statesmen who do not possess a proper conception of the rights and aspirations of authors and artists, have made sad havoc with this last bill.

(*e*) Proof of this is that in February, 1891, the Senate *actually passed* an amendment which was embodied in the copyright bill, and which for several days *abolished* completely all domestic copyright.

It was not until an outsider—a New York lawyer—pointed out the *faux pas* that the amendment was rescinded.

TOPOGRAPHICAL RECONNAISSANCES WITH THE AID OF PHOTOGRAPHY.

BY COL. LAUSSEDAT,
Member of the Institute of France.

THERE are two cases to be considered in rapid reconnaissances. That in which the operator may remain for some time in a locality which he desires to map out to a tolerably large scale, for example $\frac{1}{10,000}$, or even larger in certain special cases; and that in which he must pursue his itinerary without interruption, contenting himself with gathering the data strictly necessary for the mapping of his journeyings on smaller scales down to $\frac{1}{20,000}$ or $\frac{1}{50,000}$, or

even smaller, purposing only to represent on the plan the principal features of the country which he traverses.

In the first instance he should proceed, as do all engineers, to measure a base line as exactly as the means at his disposal will allow, following this with a triangulation from this line as a base. It is outside the scope of this article to deal with methods involving triangulation proper.

Where photography is used the principal condition to be met is, that one after another each station should be visible from at least two others, and that the country should be open. Sometimes this condition cannot be fulfilled; in that case, some details will escape the operator, but if the amount of precise data which can be gathered in a short time by photographic means is compared with the results obtained at the expense of much time and trouble by the other methods, the immense advantages of that with which we deal will be recognized at once. In open and hilly country for rapid work the photographic method has a great future. It may be affirmed even that those methods which had to be adopted formerly, cannot be compared with it.

Here it may be well to bring to mind the strong recommendation of Beautemps Beaupré to travelers, "to resort to landscapes drawn under the form of panoramas," in order to avoid the mistakes arising so often from trusting to the directions of ignorant guides.

The illustrious hydrographique engineer invented and applied this method more than forty years ago, when at his request this recommendation was reproduced by Arago, in a report dated 1846, without any allusion to the possible employment, in such cases, of photography which had just been invented.

As far back as 1849 we ourselves employed in hydrographic reconnaissances, views, geometrically exact, drawn with the aid of the camera lucida, and it was only after having tried the method of Beautemps Beaupré that we proposed, as soon as out-door photography began to be practicable, the substitution of the photographic camera for the camera lucida.

We do not fail to recognize that the employment of the

camera lucida requires too much time to be recommended for current use. Nevertheless, travelers who are handy with their pencil might often make use of it with advantage, for the purpose of economizing their stock of dry plates. The complete proscription of this very exact and portable instrument would hardly be justifiable.

Properties of the Sketched or Photographed Views.—Each of the views sketched in the camera lucida or photographed, which we recommend for use, is a conical or central perspective upon a vertical plane. In exceptional cases the

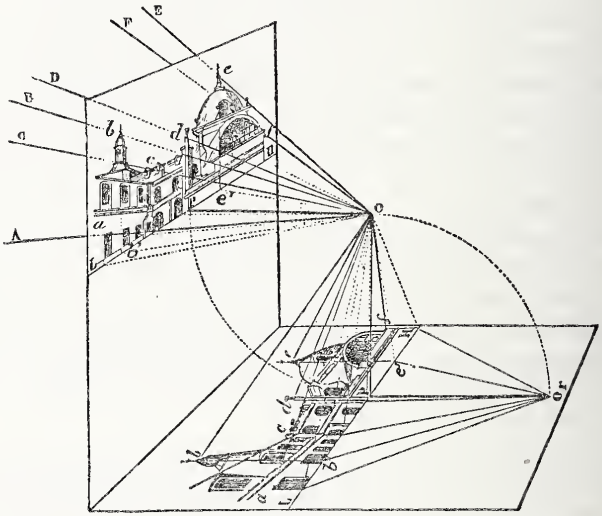


FIG. 1.—PERSPECTIVE OBTAINED BY THE CAMERA LUCIDA.

plane may be inclined. In all cases it is designated under the name *picture plane*, and the position of the *point of sight*, which is the apex of the cone of visual rays intercepted by this picture plane (supposed transparent), is perfectly determined by the very nature of the instruments.

With the prismatic camera lucida this *point of sight* is located at the centre of the eyepiece, and in the photographic camera coincides with the optical centre or interior nodal point of the objective.

A glance at the preceding figures will suffice to show the

manner in which each of these instruments modifies the picture.

In the first is seen how in the camera lucida there is thrown upon the bed of the instrument, where it is easily drawn, the image which would be formed on a transparent vertical glass situated in front of the marginal angle where the observer places his eye, and at the same distance from it as is the drawing board to which is affixed the paper on which the picture is drawn.

The second figure shows the effect produced by the objective in the camera, the image projected upon the sensitive surface is evidently, but inverted, the image which would be seen on a transparent glass, placed at the same distance in front of the centre of the objective that the sensitive plate is behind it.

The point O, at which all the visual rays meet (in Figs. 1 and 2), is what we have already called the point of sight.

Let us consider the two figures of the ideal vertical image opposite the point of sight, and let us imagine a horizontal plane, called *the plane of the horizon*, which passes through this point. The trace L H of this plane on the picture plane is called the *horizontal line*, and the length of the perpendicular O P, let fall from the point O upon L H, is the distance of the point of sight from the picture.

Finally, if we pass through the point O a vertical plane perpendicular to that of the picture, its intersection with the *horizontal line* at the point P is called the *principal line*, and the point P itself is the *principal point* of the perspective.

The distance of the point of sight from the picture is the essential element of all the constructions and of all the measurements which are to be made.

So far as pictures drawn by the aid of the camera lucida are concerned, the distance, OP, of the point of sight from the picture can be measured exactly. We will show further on (in The Annual for 1896) how this distance for photographs can be obtained, by well-known methods (except in the case of pinhole photography).

Suppose this distance determined with great exactness, say within .004 of an inch, and admit that it is 12 inches,

which we have adopted for the camera lucida. Referring to Fig. 1, following the direction of the visual rays beyond the ideal picture to the corresponding points of the landscape or of the building represented, it is seen that a rigorously exact geometrical image replaces the ground or the buildings even to an inexperienced topographer.

If, for example, we consider in place of the highest points, B and E, of the real edifices, their image, b and e, and let these images be projected to b′ and e′ on the horizontal line LH, then through the point O imagine the lines Ob′ and Oe′;

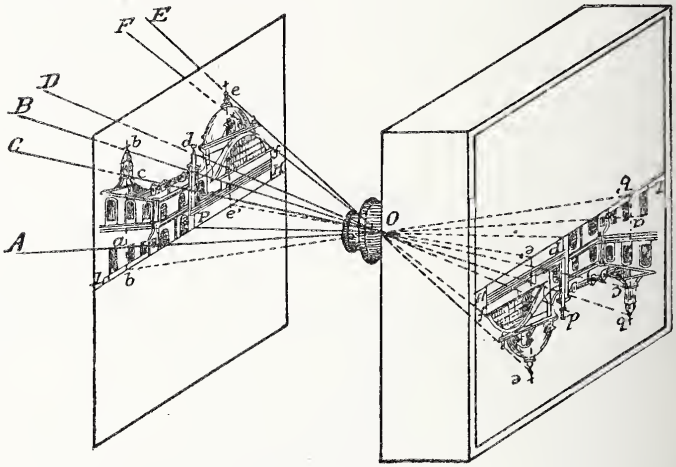


FIG. 2.—PERSPECTIVE OBTAINED WITH THE CAMERA.

it is clear that the angle b′ O e′ would be the horizontal reduction of the angle of the two visual rays, OB and OE.

To obtain this angle graphically one has only to revolve the horizontal plane and with it the point of sight, O, around the horizontal line to O_r, and to draw the two lines, $O_r b'$ and $O_r e'$.

Likewise letting fall from such points of the photograph or drawing, as may be chosen, perpendiculars upon the horizontal line and joining the feet of these perpendiculars to the rotated point of sight. The horizontal projections of just so many visual rays will be obtained, which may be

used to find the corresponding projections of the points by the well-known methods of intersections.

Referring to Fig. 3, which shows two views *aa* (represented at *a'a'* to avoid confusion), and *bb* taken from the stations A and B; the view from C is not shown. A, B, and C are stations from which the views of the landscape or group of buildings, have been obtained under as rigorously geometrical conditions as possible (in this case one of the sides of Fort Vincennes, near Paris, has been chosen). The operations are as follows:

1st. The measurement of the base line, AB, either directly or by calculation from a triangulation.

2d and 3d. Measurement of the angles which two visual rays, say one from the point A and the other from the point B, and traversing the same point of the landscape—*e.g.*, in the present case, the lightning rod of the dungeon, near the centre of each of the perspectives—make with the AB or BA. These angles may be, and for the most part are replaced by those which the direction of the principal point makes with AB or BH.

To find the projection of any point whatever recognized in both views, all that is necessary is to project the corresponding visual rays, and to find their intersection. In Fig. 3 the points thus determined on the plan are easily recognized; for example, the extreme angles of the barracks, the watch towers of the battlemented wall, which surrounds the base of the dungeon, three of the towers of the dungeon, etc. In order that the result may be satisfactory, the angle of the visual rays should not be too acute. There will be noticed in Fig. 3 a third station, C, from which a view, C C, has been taken, and which is not represented but which may be referred to, and combined with one of the two others, either to determine different points or to check those resulting from the two first.

The horizontal line of a perspective view like a a, or b b, being the trace of the horizontal plane passing through the *point of sight* on the *picture plane*, *all points of the landscape situated in this line are on the same level as the point of sight.* Starting from this, it is easy to see how one may calculate the differences of level of the point of sight (or of the *station*,

which is lower by an amount of 1^m, 20 to 1^m, 50, which should be measured exactly and recorded in the note book) as well as that of all the points recognized. For example, admitting that the plan is prepared on a scale of $\frac{1}{7000}$ (actually it was drawn on a scale of $\frac{1}{2000}$, but reduced to bring it within the limits of the page), if we measure, 1st, the apparent height, 15 ^{mm} of the lightning rod above the horizontal line; 2d, the distance from the point A to the foot of the perpendicular let fall upon the horizontal line, viz.,

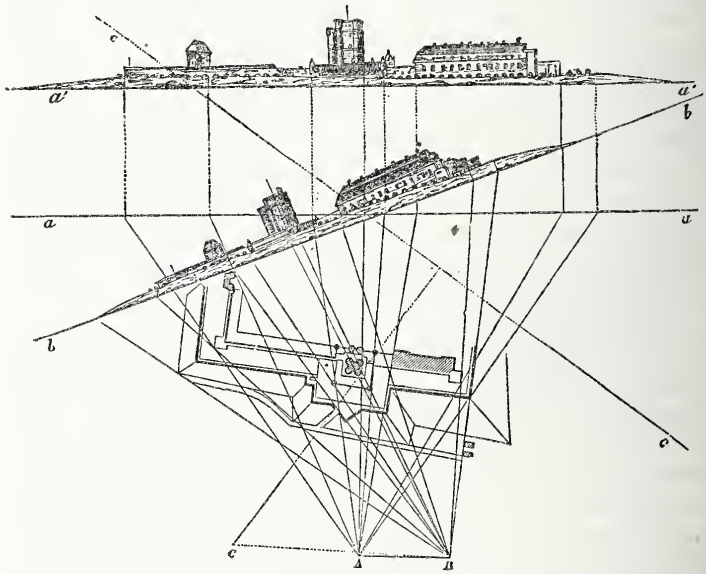


FIG. 3.—PLAN OF THE FORT OF VINCENNES.

67 ^{mm}; and lastly, the distance on the plan of this point from the centre of the dungeon, viz., 37 ^{mm} by simple proportion, we have $67 : 15 :: 37 : x$ from which $x = 8.^{mm}, 28$. The real height is obtained by multiplying by 7000, which gives 57 ^{m}, 96. The same operation, which can easily be solved by the slide-rule, gives the differences of level of any points to be found on the plan. As observed above, the height of the instrument, *i.e.*, the height of the point of sight above the station must not be forgotten. In the present example this

height was noted at $1^{m}, 40$, and consequently the difference of level is $57^{m}, 96 + 1^{m}, 40 = 59^{m}, 36$. Moreover, it is evident that by repeating the operation on a second perspective, which includes the same two points, we have a very simple means of verification of the result.

With a little practice one is able, on comparison of the different views, quickly to recognize the identical points serving for the tracing geometrically of the streams, roads in the country, and streets and houses in inhabited regions. When these first lines have been located, we proceed to determine the boundaries of the principal cultivated regions, woods, fields, prairies, orchards, vineyards, gardens, etc.

In almost wild regions we will first have to locate the water courses, marshes or lakes, then parts of the country covered with a sufficiently defined vegetation, and, lastly, the principal elevations of the country, rocks, dunes, etc. This planimetrical work finished, the very simple determination, or, better, calculation, of the altitudes of as many points as may be deemed necessary to show plainly the relief of the territory covered, is next in order.

The tracing of the contour lines follows, the operator guiding himself by these bench marks, as well, as the apparent forms faithfully delineated on the sketched views, and, better still, in the photographs.

Necessarily, practice is required to enable one quickly to interpret the views—to enable one's self to translate shapes necessarily altered by perspective—but it cannot be doubted for a moment that this interpretation, made in the presence of accurate views, at one's leisure, and calmly, is surely more satisfactory than the expedients and off-hand methods which one habitually is obliged to adopt when rapidly traversing a region without being able to return to points once left, and where, through force of circumstances, false impressions have been derived, of forms which could only be guessed at, without examination of the same under other aspects.

FORMALDEHYDE: ITS CHEMISTRY AND PREPARATION.

BY JAMES H. STEBBINS, JR., PH.D.

AS formaldehyde has of late been introduced to photographers under the trade name of "formaline," as a hardener for gelatine films, it occurred to me that a brief account of the properties and mode of preparation of this interesting body, might possibly be of interest to the readers of THE PHOTOGRAPHIC TIMES ANNUAL.

Without attempting to relate the many methods of preparing this compound, I will confine myself to two, namely, the method usually practiced in laboratories upon a small scale, and the technical method of producing it in large quantities.

Formaldehyde can be obtained either as a gas, or in the liquid form, the latter being merely an aqueous solution of the former, and in either case it is formed by the oxidation of methyl alcohol, thus:

Methyl alcohol		Oxygen		Formaldehyde		Water
CH_3OH	+	O	=	$HCHO$	+	H_2O

That is to say, that one atom of oxygen unites with one molecule of methyl alcohol, to form one molecule of formaldehyde, and one molecule of water.

In the laboratory this oxidation is best accomplished as follows:

A half-litre flask containing 200 grammes of methyl alcohol is heated on the steam bath to 45–50 deg. C., while a strong current of dry air is sucked through it by means of an aspirator.

The air is dried by being first passed through a Woulff bottle charged with concentrated sulphuric acid. From there it enters the half-litre flask through a glass tube, and emerges from the latter charged with the vapor of methyl alcohol into a hard Bohemian glass tube 30 cm. long, inclined upward at an angle of about 45 deg.

The latter tube contains at the end nearest the alcohol flask a spiral of copper-wire gauze about 5 cm. long.

Now, in order to start the reaction this copper gauze is heated for a short time with a Bunsen burner, and the aspirator is then started.

As soon as the methyl alcohol vapor comes in contact with the heated wire gauze, the latter will immediately begin to glow, and continue in this condition as long as any alcohol remains. The oxidation products thus formed are sucked over by means of the aspirator into an empty 300 c.c. flask, where they collect in the shape of a colorless liquid consisting of formaldehyde in dilute methyl alcohol. The 300 c.c. bottle is further connected by means of glass tubes with two wash bottles, one of which is half-filled with water, and the other, which connects directly with the aspirator, being half-filled with a solution of ammonium carbonate.

While the apparatus is in operation the empty 300 c.c. flask, which we will call collecting flask or receiver, must naturally be cooled with ice-cold water, in order to insure complete condensation.

The apparatus, being once started, will run for a long while, it being only necessary to add a little methyl alcohol to the distilling flask from time to time.

The contents of the collecting flask is the most concentrated, and contains in solution about 42 per cent. of formaldehyde. The contents of the two wash bottles, however, contains likewise quite appreciable quantities of formaldehyde, as may readily be ascertained by its reducing action upon nitrate of silver.

The polymeric aldehyde (CH_2O_4) may be obtained from the concentrated liquid in a solid state by simply placing it in a flat porcelain dish, and allowing it to evaporate over sulphuric acid under the bell jar of an air pump.

The contents of the two wash bottles, or dilute aldehyde solutions, may be worked up if desired into hexamethylenamine $(CH_2)_6N_4$.

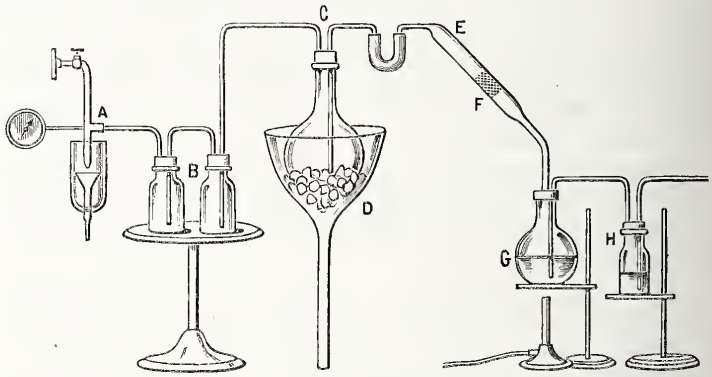
For this purpose the solutions are treated with a little ammonia and concentrated on the steam bath until nearly solid, after which it is dried over the small flame of a Bunsen burner.

The hexamethylenamine thus obtained is a white or slightly yellow colored body.

The formation of this body may be expressed by the following equation :

Formaldehyde		Ammonia		Hexamethylenamine		Water.
$6HCHO$	+	$4NH_3$	=	$(CH_2)_6N_4$	+	$6H_2O$.

In order that the process I have just described may be better understood, I herewith append a diagram of the apparatus commonly used :



A.—Aspirator.
B.—Wash bottles.
C.—Collecting flask or receiver.
D.—Funnel for ice.
E.—Tube of Bohemian glass,
F.—Copper gauze.
G.—Methyl alcohol.
H.—Sulphuric acid wash bottle for drying air.

Having now explained the manner in which formaldehyde may be prepared upon a small scale, we will next consider how it may be produced in larger quantities.

The production of formaldehyde in large quantities is based upon the German patent No. 55,176, issued to Auguste Trillat on December 17, 1890.

The process consists essentially in atomizing methyl alcohol, and bringing it, while in this state, and mixed with air, in contact with a heated porous body.

The manufacture may be conveniently divided into two parts :

1. The atomizing of the alcohol.
2. The oxidation of the same.

It makes no difference in the process whether crude, rectified, absolute, or aqueous methyl alcohol is used.

In carrying out the invention, a jacketed copper vessel, of 100 litres capacity, is filled with methyl alcohol and heated with steam to boiling. The top of the vessel is supplied with a delivery tube, which is bent over at right angles, and terminates in a fine point, or nozzle, from which the methyl alcohol emerges in the shape of a cloud of vapor.

The point of the delivery tube dips to the depth of about 1 cm. into a somewhat larger copper tube, closed at one end, and the other end of the tube is connected with the receiver destined to hold the formaldehyde.

This tube, which should be of about 10 cm. diameter and 1 m. long, and which should lie in a horizontal position, is supplied with an enlargement, in the centre, which is filled with a porous body, as, for instance, wood charcoal, gas carbon, coke, or brick dust, etc.

The horizontal tube may be heated direct, until the porous body it contains has assumed a dull, or bright red heat, according to the nature of the alcohol which is used, after which the receiver is connected with an air blast.

To start the apparatus the alcohol in the vessel is brought to a boil.

The vapor issuing from the fine point of the delivery tube then strikes the hot porous mass in the horizontal tube D, and in presence of the air from the air-blast is oxidized to formaldehyde, which in turn is sucked over into the receiver.

Formaldehyde may in this manner be either obtained in solution or in combination with some other substance.

To obtain it in solution it is necessary to conduct its vapor into either water or alcohol. In the second case its vapor is brought in contact with some body with which it is capable of forming either addition or substitution products.

In the first case a product will result which may be used in the laboratory, and in the latter case products will be obtained which may be used in the manufacture of dye-stuffs, etc.

From the foregoing it will be seen that in this, as well as in the process first described, the formation of benzaldehyde

is due to the oxidation of methyl alcohol, the only difference being that this is effected in a slightly different manner.

Formaldehyde is a powerful reducing agent. In aqueous solution it reduces ammoniacal nitrate of silver to metallic silver, forming a mirror on the sides of the vessel containing the solution. It unites with bisulphite of soda or potassium, to form a crystalline addition product. This reaction may advantageously be used for separating formaldehyde, as well as homologous aldehydes from mixtures of other bodies. It also forms condensation and addition products with a large number of organic substances, some of which have found application in the arts. It will thus be seen that formaldehyde is a body of manifold uses, and I trust that its advent in photography may open up a new field of investigation which may be as fruitful of results as in its application to some branches of industry.

EXPERIMENTUM DOCET.

BY J. J. HIGGINS, A.M., M.D.

IT is not the business of the professional photographer to experiment—he has his formulæ and experience by means of which he secures the desired results—for what? His *support*. Any change or variation is with him, the risk of loss of money. Not so with the amateur—he pursues the art for *pleasure*, and it is to him that the road is open to become the expert and scientist. Why, then, is experiment and research not more customary with them? Only too gladly would the journals publish their reports. Take *e.g.*, the developer—with the formula you are using you obtain a good negative. Are you entirely satisfied with it? If you are, you should rank with the "Immortals," but if not, try against your regular formula one containing only half and another double the quantity of alkali, and carefully judge of, and note the result. It is instructive, and you will feel that you know more than you did previously, and can now speak in relation thereto from your *own* knowledge. Again, the difference

between rapid and slow development, using your regular formula with a given time, *versus* the same diluted with an equal quantity of water, and double the time. Yon will say very likely the resulting negatives will be identical. Well, try it.

In this, as in all similar experiments, there is only one correct mode of procedure. A plate (say 4 x 5) after exposure must be divided, and the one-half tried against the other. For this a cutting diamond, with which to bisect the plate, and a cutting board, which anyone can make for himself, is all that is necessary. Any experiment based on plates exposed successively the one after the other is worthless—the plates may differ, and the light, however similar it may seem to be, can never be depended on, as being the same for even an instant. Light waves (the present theory) are, like the waves of the sea, in constant change. Again I say experiment, and you will be astonished at how much you will find out —*and know, that what you know, you really do know.* The experimentalist will find, for instance, that the addition of ferrocyanide of potash to the eikonogen developer is made with happy effect, but when it is suggested to use it with metol he declines. Again, that hyposulphite of sodium is a powerful accelerator when used with the ferrous oxalate developer, but with metol is a retarder. That excess of sulphite in any developer, but especially with eikonogen and metol, causes great reduction of density. That borax does not as stated hasten or strengthen the action of eikonogen but the *reverse.* That you will be highly pleased if, after development and the usual washing, you give your negative a bath of tartaric acid one drachm, water eight ounces, for a minute, then rinse and place in your hypo. That all hypos containing alum or acid are frauds, and that in time you will return to the simon-pure article with, when you know about it, a ¼ lb. of *sulphite* of soda crystals to the pound of hyposulphite of soda. And so I could continue instancing, but why should I rob you of the pleasure that always is attendant upon one's own discoveries? Undoubtedly you have noticed that with an instantaneous or very rapid exposure the corners of your plate are apt to be thin when

using a 6-inch lens on a 4 x 5 plate. Which will aid in their not being so? A large stop, full opening of lens, letting a whole flood of light in, or a small stop? Do not answer off-hand, but try. Try, and see by which comes the betterment, and if sufficient to satisfy, and probably the question will force itself upon you (and it will be a very disagreeable one) —how can I get a clean sky to the extremes of plate, giving no smoky corners in the print with the most rapid exposures when using only a 6-inch lens on a 4 x 5 plate, the usual outfit of the hand camera? And yet it can be done and without difficulty. And in this connection I would ask, Have you ever thought that it is not the base line (5 in.) of your plate that your lens must cover, but its *diagonal*, which is only fractionally short of 6½ inches? This is requiring a good deal of a 6-inch lens with full opening—*f*/8, ¾ of an inch opening—and definition as good to the extreme corners as you want—so good that simply for *its* improvement you would never stop down. And yet they exist, for I have one,—and were it not that the editors of this ANNUAL are always chary of space, would ask your indulgence in relation to the matter of lenses for the detective or hand camera.

THE VISIBLE AND THE LATENT IMAGE.—A DISPUTED PHOTO-CHEMICAL THEORY.

BY C. RAY WOODS.

THE cry of the photographic world, if the requests of editors can be taken as a guide, is, "Give us something practical!" With the neglect of theory I too can sympathize, if the following extraordinary definition of the word, which I take from "Webster's Condensed," is true:

"THEORY—A doctrine or scheme of things, which terminates in speculation or contemplation, without a view to practice."

I have somewhere heard or read of theory as "binding in one connected chain a series of isolated facts with a view to the extension of that chain by the discovery of other facts."

The modern scientific man requires all this in a theory; hence his theory should be eminently practical. I wish, therefore, to occupy a page with a presentation of a series of facts in logical sequence bearing on a matter on which some difference of opinion exists, chiefly, I believe, because the facts are scattered and few have taken the trouble to gather them up for themselves.

Fact I.—Wöhler found that when dry hydrogen gas was passed over citrate of silver heated to 100 deg. C. a bronze powder was formed which dissolved in water, producing a port-wine-colored solution. From this solution potash precipitated a black compound which appeared to have the composition Ag_4O. From the same solution hydrochloric acid precipitated a gray substance which, according to Wöhler, had the composition Ag_4Cl_2, but, according to Bibra, Ag_4Cl_3. The experiment is not a difficult one to perform but requires some little time and patience, and the difficulty of preparing a quantity is probably the cause of the divergence of opinion as to its composition. Possibly there may be more than one sub-chloride.

Fact II.—In more recent years Hodgkinson demonstrated that when citrate of silver is acted upon by light, the substance produced is similar in its reactions to the compound produced by the action of hydrogen.

Fact III.—The compound produced by the action of light on silver chloride is acted on only with great difficulty by nitric acid.

Fact IV.—If pure chloride of silver suspended in water be darkened by the action of light, the presence of chlorine may be detected in the water by the ordinary silver nitrate test. And a bromide plate exposed to light emits a smell of bromine.

Fact V.—Becquerel found that if a film containing chloride of silver be exposed a short time to mixed light and then under colored glasses, the compound formed takes upon itself various colors.

Fact VI.—Carey Lea found that by the action of alkaline hypophosphites, etc., similar colored compounds were formed.

Fact VII.—Berzelius found that perfectly dry chloride of

silver in a hermetically sealed glass tube liberates chlorine when exposed to light. In the dark the chlorine is reabsorbed.

Fact VIII.—In a repetition of the preceding experiment, carried out by the writer under Captain Abney's direction, it was found that the darkening action of light was very slight, but the accidental intrusion of a small globule of mercury caused the action to continue, the mercury combining with the liberated chlorine.

I might add to the foregoing, but the most important facts are sufficient. Taken together they show: First, that by chemical means or by the action of light on chloride of silver a substance is produced containing less chlorine. Second, that it is not a mixture of silver and chloride of silver. Third, that it is not an oxychloride of silver, for it can be produced when the greatest care has been taken to exclude oxygen or any compound that would yield oxygen. Hence the existence of *sub*-salts of silver is no mere supposition; it is the only theory that will fit all the facts.

Now for a practical application of the theory. The action of an acid on a subchloride would be to convert it into silver and chloride of silver, the silver being dissolved; as pointed out this only takes place with difficulty and the acid must be strong. An alkali will also convert the subchloride into silver and chloride of silver, dissolving the latter. In the case of an organic subsalt, as in albumen or printing-out paper, the action of an acid would not be of a reducing but of an oxidizing nature; the action of an alkali would be to form a suboxide. Hence the necessity that the fixing bath should be alkaline. Some interesting experimental facts are given in Hardwich's Photographic Chemistry confirmatory of this reaction, and the result arrived at that the fixed print is a mixture of silver and silver suboxide is an important testimony in favor of the greater permanency of an image produced by development and containing silver only.

Is the action of light of a chemical nature when its result is not manifest to the eye? Why not? The chemical action of light is not sudden and it must have a beginning, such beginning being imperceptible to the eye. It is permanent

if some absorbent of the halogen liberated is present; and we know that it must be present in a wet plate as free nitrate of silver, in a dry collodion plate as some preservative, in a gelatino bromide plate as the gelatine itself. That some physical, some molecular motion is first set up before it gathers sufficient impulse to tear the atoms of silver and halogen apart is probable, but if no chemical action has taken place, the motion must soon return to a state of rest; how, then, by the physical theory account for the long keeping of an exposed plate without a disappearance of the developable image?

I add to the above, since reading the proof-sheet, a practical hint based on theoretical grounds. Since subcitrate of silver is soluble in water it should be possible to wash out part of an untoned and unfixed image. I have taken a commercial printing-out plate, exposed it to light and let water run from the tap over one-half of it for an hour. Result: half, or nearly half, the image gone; gone, not changed merely in color, for, on fixing the plate, the result is confirmed. If, therefore, a plate has been printed too deeply, wash well in plenty of water. If, on the other hand, the image is thin, wash a few times with the smallest possible quantity of water.

PORTRAITS IN THE OPEN AIR.

BY G. VIEUILLE.

IN the few lines which follow I wish to protest against the idea that it is impossible outside of a studio to make good photographic portraits, and to give to amateurs some practical pointers on the manner of obtaining them in a very satisfactory manner without having recourse to costly and complicated arrangements. In fact, everyone has not at his disposal an apartment in which are united the conditions of size and lighting necessary for obtaining those beautiful portraits which make the reputation of specialists; but it is easy, in the country especially, to find a spot sufficiently protected from the sun, which, with the help of

curtains and drapery suitably arranged, can be converted into a sort of studio where the light will be softened and at the same time concentrated on the subject to be photographed.

The shady side of a dwelling, of a wall, or if need be in the shadow of a clump of trees answers very well; the direct sunlight should never penetrate the spot selected. Pointed uprights should be fixed in the ground and their tops connected with light cross-pieces. This forms a sort of framework, easy to take down, and the dimensions of which must be sufficient fully to protect the subject, and on which will be stretched the curtains destined to modify the light. Thus the ceiling will be formed exclusively of blue or violet muslin; the side from which the light comes should be provided with curtains more or less transparent of the same color, and easy to manipulate. Strictly speaking, a simple screen of rose-colored or white muslin, cutting off the light from above the subject may suffice in many cases; but to obtain relief and a certain vigor in the portrait, it is necessary that the contrast between the lighted and unlighted portions be clearly defined. For this side a gray or dark shade with a mat surface may be employed with advantage. As to the background, as I pointed out in last year's ANNUAL, it should be of cloth painted and appropriate to the subject, placed so far away from the latter as not to be reproduced sharply in the picture; especially avoid placing the subject against a background of foliage, which rarely produces a good effect.

If only vignetted portraits are to be made it is useless to take into consideration the ground; but for full length portraits or for groups, besides rustic decorations easily prepared by one's self, it will be necessary to use a carpet, or preferably and especially if the background represents a landscape, a thin layer of turf cut and dried and kept for this purpose. This sort of a carpet accords very well with the background and gives a very natural effect to the setting.

Although professionals preferably employ a special lens for portraiture which permits them to obtain good pictures

with a minimum exposure, I think the ordinary material of the amateur should suffice in most cases, save perhaps for portraits of children or nervous persons, for then it is indispensable to work with great rapidity, and consequently to have recourse to rapid objectives. Lastly, the fact must not be lost sight of, that softness and harmony are obtained as much by the lighting as by a slight over-exposure, and an appropriate development.

GLYCINE.

BY W. J. STILLMAN.

IN recent experiments with the new developers, I have been confirmed in the good opinion I had formed in the earlier ones, of the qualities of glycine, and have been more precise in the study of the manner of preparing it. The solubility is very low, and I am not sure that I have found its measure yet, but, as I have used it, I am convinced that it is the best and safest developer for the very sensitive plates at very short time of exposure. I dissolve it, or as much of it as will dissolve, in the proportion of two per cent. in boiling water, together with six per cent. of sulphite of soda, putting them on a filter and running the boiling water through them. There is still a residue of the general appearance of the original glycine, but whether it is simply undissolved glycine or a compound which will not dissolve, and formed from the combination of the two substances, I do not know, and have not had the time to investigate. The amount of it is not large enough to be of account. I do not add the alkali to the solution, and in general I may say that I do not approve of or use the one solution developers of any kind, as the amount of alkali needed varies with the exposure and the nature of the negative required. I make a saturated solution of the compound carbonate of soda and potash and keep it in small bottles, adding from one-tenth to one-twentieth per cent. of the developer as needed.

The glycine, as thus prepared, keeps perfectly, so far as

my experience goes, and needs to be diluted with an equal quantity of water, or double the quantity, as the nature of the negative wanted should indicate. It requires no addition of bromide for ordinary cases, develops as thoroughly as pyrogallol, and has, in normal conditions, no tendency to fog, but brings the negative up slowly and brightly, permitting the continuation of the development indefinitely without danger of staining the negative, as pyrogallol and hydrokinone do. I have succeeded in developing exposures of the one thousandth of a second without excessive density of the high lights and without the least stain, though the development was prolonged beyond all comparison with the possibilities in the case of using pyrogallol.

It is absolutely equal in power of development to pyrogallol, which the most careful and elaborate experiments with all the new developers justify me in declaring not to be the case with any other of them, neither metol, nor amidol, nor any other, reaching the same degree with the old friend, except glycine. It does not discolor in the bath, and when the development is finished the developer is as clear as when it began, and scarcely colored, so that it is possible that it would serve equally well for successive exposures, but this I have not yet investigated. I am convinced that it is perfectly qualified to supersede pyro, and that it is the only developer thus far discovered that will do it. The mixture with it of about a quarter of metol solution of the same strength will accelerate the development, which is slower than with pyro, and, so far as I have observed, it does not produce any ill effect, as the substances are allied in chemical nature.

For studio work, and where the exposure is easily extended to the most convenient, I do not think that there is any advantage in the use of glycine, as the requisite density of the negative is more readily attained by the use of the pyrogallol, and it is for the development of the minimum exposures, where the density is likely to become excessive under the prolonged exposure necessary for exposures of the small fractions of a second, that glycine will be found useful, and here it is absolutely unequaled.

FURTHER NOTES UPON THE CONSTITUTION AND ATOMIC STRUCTURE OF DEVELOPERS.

BY PROF. A. B. AUBERT.

IN THE ANNUAL for 1894 (page 33) I drew the attention of its readers to the generalizations or laws which the Brothers Lumière had discovered.

I intend in this short paper to give the outcome of the many experiments which have since been made to test the truth of these laws.

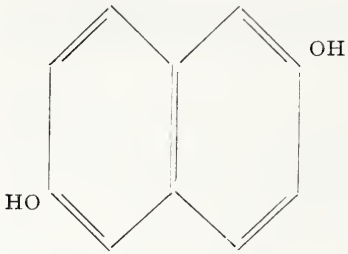
The first law, namely: "In order that a substance of the aromatic group act as a developer, it seems necessary that two hydroxyl (OH) or two amidogen (NH_2) groups or one of each be present in the molecule"; has been found to be practically correct for all of the substances examined. The second law, namely: "The paraderivatives containing OH or NH_2, are the strongest developers, though some orthoderivatives possess the power to a less degree." This law proves to be essentially correct, though it seems that a larger number of the orthoderivatives may act as developers than was at first thought probable. The metadcrivatives evidently have not the power of developing the latent image.

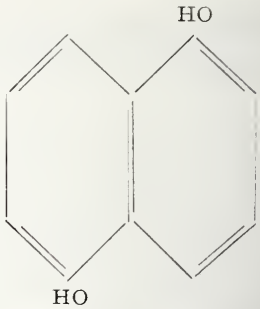
The third law has, thus far, been found to agree with all discovered facts. It reads thus: "The developing power may persist though the number of OH and NH_2 groups be greater than indicated."

The fourth law, namely: "If molecules be formed of two or more connected benzole rings or hexagons, the above rules or laws will only apply when the OH or NH_2 groups are present in the same benzole ring." Here, we find a few exceptions in the naphthaline derivatives. In which case bodies having the general structure given below may act as developers.

The fifth law: "If substitutions occur in the OH or NH_2 groups, the developing power will be lost unless two of these radicals or groups remain intact in the same ring."

Under this law it will be noticed that methylquinone, which does not fully agree with this law is, nevertheless, a developer.





We may now add to the list dimethyl phenylen diamine: $C_6H_4 \left\{ \begin{matrix} N \begin{matrix} \nearrow CH_3 \\ \searrow CH_3 \end{matrix} \\ NH_2 \end{matrix} \right.$ which acts as a developer, and dimethyl paramido phenol: $C_6H_4 \left\{ \begin{matrix} N \begin{matrix} \nearrow CH_3 \\ \searrow CH_3 \end{matrix} \\ OH \end{matrix} \right.$ which also acts as a developer, while paramidophenol in which the H of the OH is replaced by C_2H_5, $\left(C_6H_4 \left\{ \begin{matrix} NH_2 \\ OC_2H_5 \end{matrix} \right.\right)$ does not develop the latent image, and hydroquinone in which an H of one of the OH molecules is replaced by C_2H_5, $\left(C_6H_4 \left\{ \begin{matrix} OH \\ OC_2H_5 \end{matrix} \right.\right)$ also loses its developing power. No exceptions have been discovered to the sixth law; which reads as follows: "Substitutions to the H of the benzole ring do not seem to affect the developing power to any extent—provided that the proper number of OH or NH_2 groups be present."

From the above, it may be gathered that the laws have, on the whole, proved quite correct and that with some slight modifications they may be accepted as representing a fairly accurate statement of the present conditions of our knowledge in regard to the relationship which exists between atomic structure and the developing power of some aromatic compounds.

SOME RECENT IMPROVEMENTS IN DRY PLATES.

BY W. A. COOPER.

THE use of orthochromatic plates in every-day practice is not fully understood or appreciated among the mass of photographers. Because the process workers use them exclusively, lends color to the mistaken idea that these plates are only of special value in copying paintings, flowers,

Photo by W. A. Cooper. A SUBURBAN HOME. Wuestner Orthochromatic Plate.

and fabrics of all kinds for commercial purposes. They are of inestimable value in the studio, not in special cases of blue eyes and red hair, with an abundance of freckles (in this case possibly they show more pronouncedly their great value, being the strongest test they can be put to), but in all kinds of studio work; and why? Without going into the question scientifically, it can be put in a nutshell and answered practically.

In every-day photographs, orange, yellow, and red photograph too dark, while on the other hand blue, violet, and

purple photograph too light. Orthochromatic plates are more sensitive to the orange, yellow, and red, and less so to the blue, violet, and purple, and that's all there is to it.

Of course, by the additional and judicious use of colored glasses back of the lens, the color value of these plates may be greatly helped.

In the case just mentioned, of the blue eyes and red hair, I would recommend the use of a light lemon-colored glass back of lens. It increases the exposure slightly, but with such rapid plates as we now have this is of very little importance, compared with the results obtained.

Before orthochromatic plates were put on the market, we experimented by soaking our ordinary dry plates in dyes that made the plates more sensitive to the yellows and reds. This worked satisfactorily.

It was not long before the makers of dry plates began the manufacture of the orthochromatic plate, and placing them on the market. These we have used ever since with a great deal of pleasure and satisfaction; they are a deal better than those you prepare yourself, because, the dyes being mixed with the emulsion before coating, the plates do not deteriorate as quickly. In fact, I find very little (if any) difference between the keeping qualities of the orthochromatic plates as now made and the ordinary dry plates.

It will, I am sure, be of interest to the readers of the ANNUAL, to know something of the man, and what he has accomplished in the way of improvements in the manufacture of dry plates, particularly so during the past year. They have been of great importance, and will take high rank among the really great advances of the year, and they have been many, especially when gelatine is used.

Mr. E. Wuestner is too modest to speak for himself, and I feel pleased, as a practical man, to endorse all he claims for his plates, and to point out to the profession the many excellent improvements he has made.

Coming from St. Louis (the dry plate city of America), about eight years ago, Mr. Wuestner saw the necessity for a good dry plate made right here in the great trade centre of this continent. That he was right, the immense business he

Photo by W. A. Cooper. Wuestner's Non-Halation Plate.

AN INTERIOR.

has built up, and the increasing demand for his popular plate is a gratifying proof. His regular 40 plate had become a general favorite with many leading photographers, because of their great uniformity and high excellence.

Not satisfied with this flattering success, and after a great deal of experimenting, the "Orthochromatic Plate" was brought out and called forth the applause and high approval of the best photographers of all lands, and were endorsed by our leading writers and men of science, not only in our own country but in Germany, that hot-bed of photographic improvements.

Still further experimenting, another child of his brain was brought forth. This time the "Instantaneous, Imperial Orthochromatic Non-Halation Plate," which was entirely new in principle, and eminently successful in practice, and possibly the most useful of all his improvements.

Still more experimenting and yet another plate is called forth, and the "Tropical" plate comes as a panacea for all the ills of photographers in hot weather, or in hot climates, and frilling, our great tormenter, is absolutely done away with.

With these plates it is not only possible to develop them with the ordinary water in the hottest of dark-rooms during the hottest days we have had this summer, but, if necessary, hot water may be used up to the boiling point, and still no frilling. When you can do this and still have a plate possessing all the qualities and speed of the ordinary or orthochromatic plate, then developing during hot weather, or in hot countries, ceases to be troublesome or a source of anxiety to those handling valuable negatives.

In addition to all these improvements, which should satisfy the ordinary mortal, Mr. Wuestner has added greater speed to all these different kinds of plates, that bring them up to anything yet produced by gelatine; his 50 plate can be used with the most rapid athletic shutter, that gives the exposure of only the two hundredth part of a second.

A few words about the new non-halation plates may not be amiss. I will explain the way these plates are made. They are triple coated, that is, each plate has three separate

coatings of gelatine emulsion, each coating of different sensitiveness, and all three possessing the orthochromatic qualities. The first coating is a very slow emulsion, the second a little faster, and the third the most rapid emulsion he makes, all perfectly united, with no fear of separation or frilling.

The theory is that while the top coatings may be very much over-timed, the lower one, being so much slower, gives a harsh, dense negative, the combination giving a perfect negative.

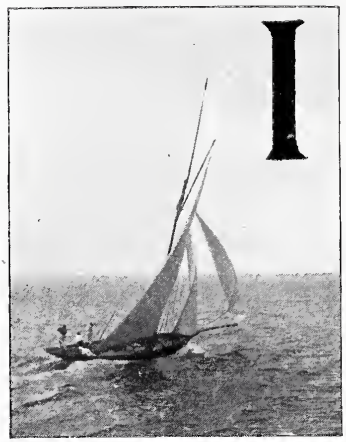
I cannot speak too highly of these plates, particularly so of the "non-halation." We will not go into the cause of halation; some claim it is reflection of glass back of sensitive film, others that it is caused by a molecular disturbance from excessive exposure; the latter we think is the most generally accepted theory, but, whatever the cause, Mr. Wuestner has gotten over it, in his own original way, and it marks a new epoch in photography, and is without doubt the greatest practical improvement of the year.

Photo by W. A. Cooper. Wuestner Orthochromatic Plate.

THE GARDEN.

A REVIEW OF THE YEAR.

BY THE EDITOR.



By W. B. Post OUT FOR A SAIL.

IN looking back over the events of the past twelve months, it cannot be said that many important discoveries have been made in the science of photography, yet it ill becomes us to despond, for on careful consideration it is difficult to see where there is any likelihood of anything startling happening. Photography in colors and other desiderata are not likely to come upon us suddenly, but to be the gradual outcome of a number of experiments and the work of many minds in the days to come. While, as already stated, no startling discoveries have been made, yet we have to chronicle numerous improvements in various photographic processes and instruments.

One thing that is most noticeable is the gradual employment of photography in the various arts, sciences and industries. How its usefulness is gradually being recognized in the most unexpected places, for instance, to mention some of its most recent applications, photography has been employed with great success in studying and recording the movements of the heart; in investigating the safety of railway bridges; in accurately controlling very high temperatures; in obtaining the horizon line in the captain's sextant; in studying the velocity and behavior of bullets and other projectiles; and in recording variable electric current curves. Hardly a week passes but what we learn of some new and important use to which it has been put. Its observing and recording powers are so far superior to man's that there is little wonder at its utilization for these purposes.

EXTENDED APPLICATION OF PHOTOGRAPHY.

Professional photography appears to be in about the same position as last year and the year before, and we might as well say the year before that, too, so little has been the apparent advancement. There is the same old cry for better prices, the same mournful tale that photography is a thing of the past, and that the business means naught but ruin.

Yet looking at the matter of prices it is a curious fact that in spite of what is said there are men to-day who are asking higher prices for their work than was probably ever before paid, and, what's more, they are getting it, too. Why? some one will ask. Because they are doing work that deserves it; they study diligently, keep up with the times, and are able to convince the public that their work is superior and worth the big prices, while their despondent and grumbling brethren hang up their show case full of dirty, faded pictures, retire to their gallery, and wonder why the people don't come, notwithstanding that they have reduced their prices to

POSITION OF PROFESSIONAL WORK.

starvation rates. Such is the real state of things to-day, such was the real state of things years ago with just as many grumblers, and so, apparently, will it be in the years to come.

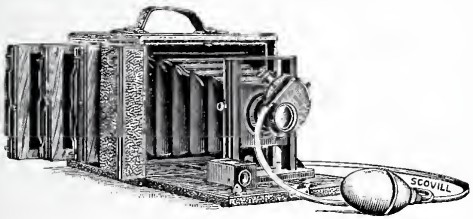
Amateur photographers in this country have, without doubt, made immense strides within the past year or so. It is not very long since that the English workers when competing at our exhibitions carried everything before them, and an award to an American in a foreign exhibition was practically a thing unknown. But we have changed all this; our amateurs have at last realized the fact that in photography they have the means of making pictures, and many of our best workers, such as Alfred Stieglitz, W. B. Post, R. Eickemeyer, Jr., Miss E. V. Clarkson, Clarence B. Moore, and several others, have not only received many awards in this country but have succeeded in capturing the highest awards in many of the English and other foreign competitions.

POSITION OF AMATEUR WORK.

While to a very great extent the articles in this ANNUAL give to the reader a good knowledge of the recent developments of photography, yet we will endeavor to enumerate the most important advancements that have been made.

With regard to apparatus there is very little that can be chronicled. The Scovill & Adams Co. have earned the gratitude of photographers by introducing a cheaper form of the well known Henry Clay Camera. This new instrument, which is here pictured, is known as the Henry Clay, Jr., and, excepting in a few minor points, is equal to the first named instrument, while, at the same time, it is considerably cheaper; in fact, considering the beauty of the workmanship and the quality of the work that has been made by it, it forms undoubtedly the cheapest camera at present upon the market.

APPARATUS.



THE HENRY CLAY, JR., CAMERA.

An English firm of opticians, Messrs. R. & J. Beck, have introduced a novelty in lenses, by means of which various foci can be obtained. The instrument is fully described in Mr. J. Traill Taylor's article in another part of this work.

The latest flash-light machine for obtaining portraits by artificial light is worthy of mention here. It is the invention of Messrs. Hunter Bros., and possesses many ingenious improvements over the older forms of this kind of apparatus. Chief among these may be mentioned the method of burning the magnesium powder so as to give the greatest possible illumination with the least possible expenditure of powder.

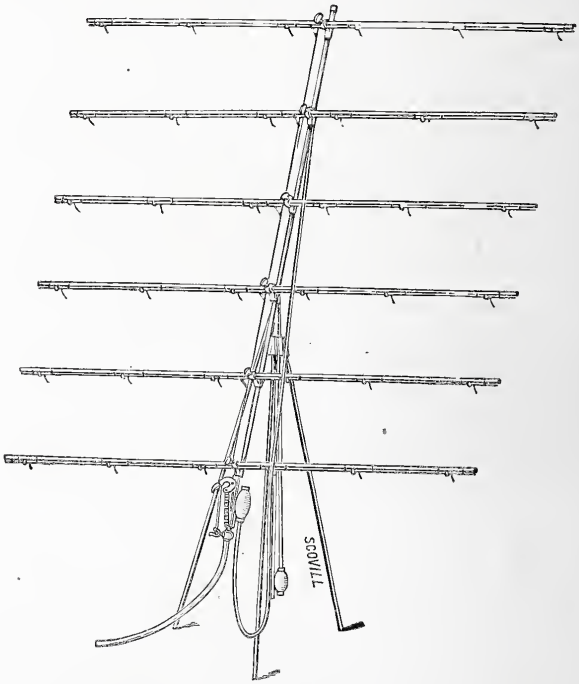
With regard to materials, we have several important additions to chronicle. The excessive heat of the summer of 1894 brought forth the introduction of two useful novelties. Formic aldehyd was discovered to be an excellent substance for hardening gelatine films upon paper and glass. An article dealing with this substance, by Dr. Jas. Stebbins, will be found on another page. It was found, however, to have a strong reducing action upon the silver haloid, a drawback which was afterward remedied by the addition of other chemicals, and the compound thus formed has been placed on the market under the name of "Antipyr." Its use in hardening gelatine negatives or gelatine aristotype prints can hardly be overestimated, it being

PHOTOGRAPHIC MATERIALS.

undoubtedly superior to any of the alums commonly employed for this purpose.

The other introduction we refer to is the Equatorial dry plate, placed upon the market by Ed. Wuestner, and which, it is stated, will withstand the action of hot water without in any way dissolving or frilling. Such a plate will undoubtedly fill a long-felt want by photographers working in tropical climates, and by all during the hot summer months, when, hitherto, developing has been obliged to be deferred to the coolest days or large quantities of ice used at considerable expense, trouble and annoyance.

The S. P. C. Hardening and Fixing Compound, which, although



HUNTER BROTHERS' FLASH-LIGHT MACHINE.

but recently introduced by the manufacturers, is undoubtedly a popular article, if one can judge by the enormous sales of it. The solution not only fixes the negative and hardens it, but at the same time has a clearing action which results in negatives of perfect clearness and brilliancy.

Notwithstanding the recent introduction of numerous developing agents, pyro continues to hold its ground, and it is more likely to do so since the introduction of "Merck's Superior Pyro," which we have ourselves tried and can confidently recommend. It is lighter, whiter and purer than any pyro we have ever handled, and the negatives developed with it have surprised us with their bright, sparkling qualities, vieing in beauty with the collodion wet plate.

By James L. Breeze.

PORTRAIT.

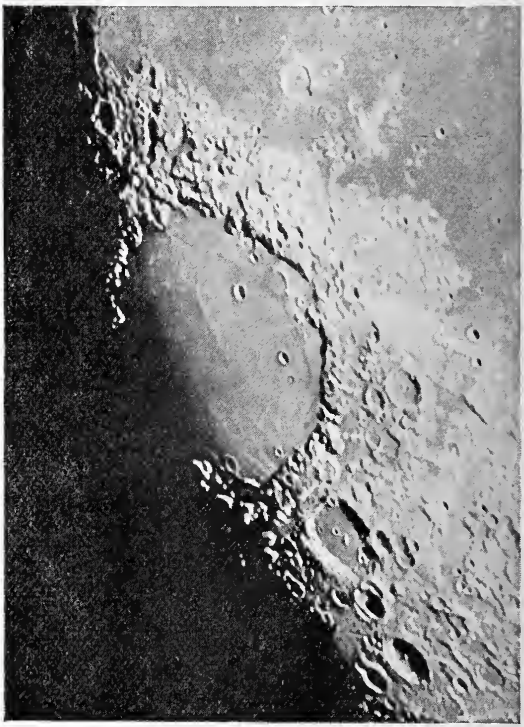
In these days of space annihilation and when every one is traveling, the amateur is everywhere with his camera, and his wants when traveling have been thoroughly well catered for by the manufacturers. Cameras and other apparatus are made of the very lightest and as compact as possible, and now we have compressed developers in the form of tablets. Messrs. John Wyeth & Bros. have introduced a number of these, and the photographer can carry with him, in the handiest form possible, these little tablets which, on solution, form accurately prepared developers, clearing, fixing and toning baths.

One or two new printing papers have been introduced by the manufacturers, and the battle between gelatine and collodion still rages. The paper that apparently holds its ground against all opponents is the Ilo collodion paper. We hear nothing but praise of this, and from prints that we have in our possession, made some time ago, and which have been subject to very disadvantageous circumstances we can easily imagine them to be absolutely permanent in the most reasonable sense of the word.

PHOTOGRAPHIC PAPERS.

Another paper which has found considerable favor with a large number of consumers, is the Nepera. We have not been able to discern whether gelatine or collodion is used in this, but there is no doubt that it is sufficiently hard to stand the worst handling, and is remarkably easy to tone, and reliable in its results. The same firm have introduced a very perfect bromide and a platino-bromide paper, the latter so called on account of its resemblance in the results to pictures produced by the more expensive platinotype process.

South.



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PHOTOGRAPH OF THE MOON TAKEN AT LICK OBSERVATORY.

PHOTO ASTRONOMY.

The application of photography to astromonical work still results in continued discoveries in nebulæ, star clusters, comets, and other curious heavenly bodies.

The authorities at Lick Observatory have been very busy photo-

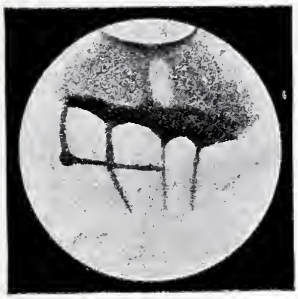
graphing the moon during the course of a lunation from new to full moon. A whole series of pictures have been taken and give a very perfect representation of the lunar topography as it is now. Some of these pictures have been enlarged so as to construct a map on a scale of ten feet to the moon's diameter, one inch corresponding to about seventeen miles.

Some valuable photographs of the planet Mars have also been made at the Lick Observatory, showing many interesting details of the planetary surface.

A number of minor planets have been discovered and some missing ones re-discovered, all by the agency of photography.

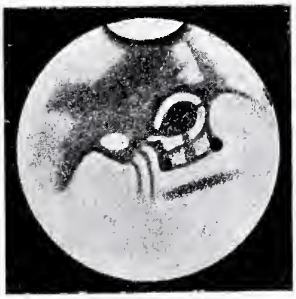
The work in connection with the international photographic chart of the stars still progresses satisfactorily. Some idea of the immensity of this undertaking can be gathered from the fact that 22,054 plates are required to cover the sky. Each plate will contain on an average 250 stars, making a total of more than five and a half million points which will require to be measured. It will probably be well into the twentieth century before the work is completed.

During the year important work has been continued in connection



By Prof W. W. Campbell.

MARS AUG. 9.



By Prof. W. W. Campbell.

MARS AUG. 17.

with sidereal spectroscopy. The photographic spectra of a large number of the brightest stars have been obtained, enabling investigations to be made as to their chemical constitution, age, and the stage of evolution to which they have reached.

Every day, wherever possible, the solar surface has been photographed for spots and faculæ. Much discussion has taken place regarding the simultaneous disturbances on the sun's surface, and on the magnetic condition of this earth; but, apparently, no satisfactory conclusion has been arrived at.

PHOTO-MECHANICAL PRINTING.

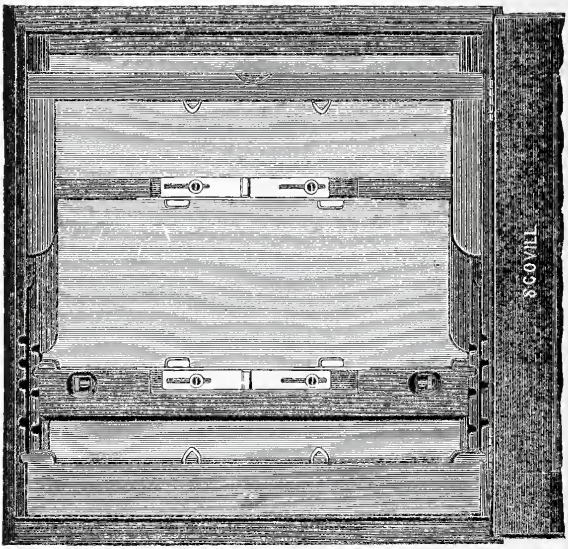
In photo-mechanical printing proeesses and photo-engraving there is but little to record. Everywhere we find experiments being made to obtain a perfect method of three-color printing. Apparently no reliable process has yet been perfected, for while we have seen some very beautiful pictures obtained by this method, yet it is obvious that these have been selected subjects and that the process is not an all-round perfect one, and consequently of comparatively little value commercially. Some of the best three-color pictures by the collotype and gelatine printing processes have been made by Mr. Ed. Bierstadt, who has devoted many years of study to this subject. In half-tone three-color work the finest examples yet submitted to us have been produced by the Photo-chrome Engraving Co.

Max Levy has invented and patented a new line-screen for half-tone work, and from comparative examples we have seen, we can easily believe it superior in its results to any other.

The usual trouble and annoyance attending the fixing into position in the camera of the line screen has at last been overcome by the introduction of a perfect piece of apparatus manufactured by the American Optical Company, termed a screen plate holder, and shown in the accompanying cut.

PHOTOGRAPHIC CHEMISTRY.

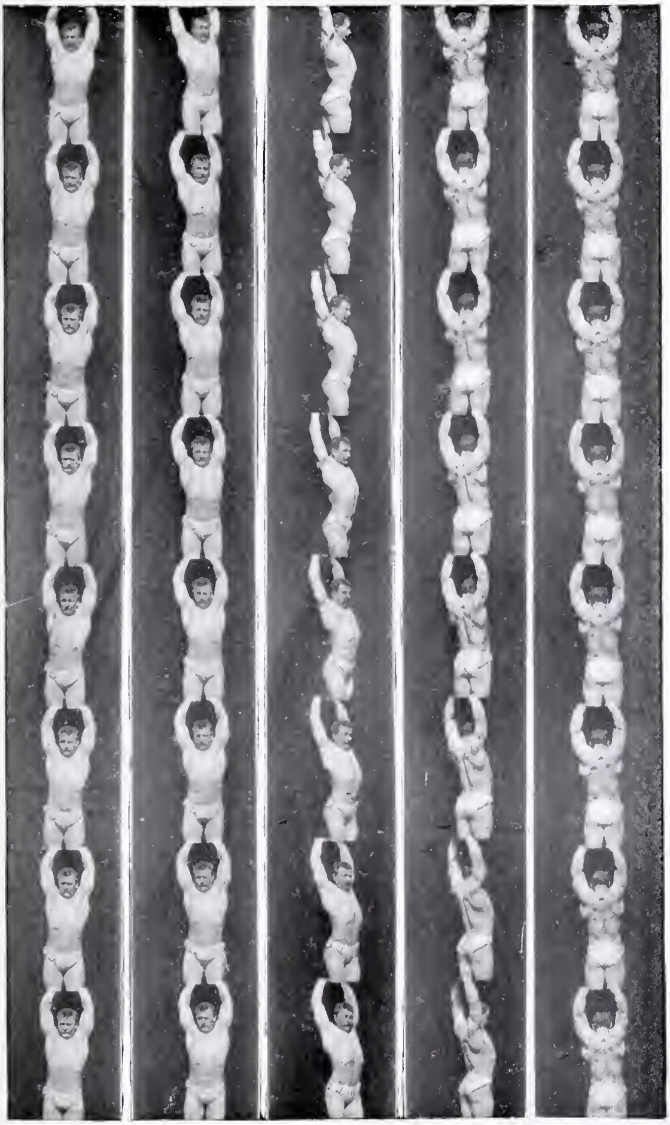
R. Ed. Liesegang, the son of the celebrated Dr. Liesegang, and who is a rising young scientist, destined to make a name in the world, has contributed very much interesting matter to the literature of photographic chemistry, more especially with regard to the action of various compounds to light, such as those of bismuth, antimony, manganese, thalium, tungsten, vanadium, etc. Messrs. Lumière Bros. have given an interesting summary of the behavior of cerium salts. They found that the ceric salts if mixed with phenols or amines will yield insoluble compounds of various colors, according to the phenol or amine employed. It is possible that there is here the foundation for many useful photographic processes.



SCREEN PLATE-HOLDER.

EDISON'S KINETOSCOPE.

If the general public were asked to name the most important photographic discovery of the year, there is little doubt but what they would be unanimous in declaring the Kinetoscope. Although the idea is by no means a new one, Muybridge, Anchütz, Marey and others having already worked at the same theory on a comparatively small scale, yet the Kinetograph can in no way be compared with the machines of other workers. While the latter consisted of a battery of at most twenty-four cameras, exposed by electricity, the Kinetograph is but a single camera, capable of making many thousands of photographs in the space of a few seconds. When Edison conceived the idea the working out of the arrangement was intrusted to Mr. W. K. L. Dickson, a clever young electrical engineer. There are few who really can imagine the thousands of difficulties that required to be overcome before such an apparatus



Photographed by W. K. L. Dickson.

KINETOSCOPE PICTURES OF SANDOW.

could be made to work satisfactorily. Imagine a roll of film one hundred and fifty feet long, which, in the space of 90 seconds, had to have impressed upon it nearly three thousand images. Imagine the delicate and perfect arrangement that had to be constructed to bring this film accurately into place, and expose it to the light each time without the slightest vibration—without the slightest hitch of any kind. Those who have studied the details of the arrangement pronounce it to be simply marvelous, and reflecting the highest credit on the clever engineer. Some account of this gentleman's career will, we are sure, be interesting to our readers. William Kennedy-Laurie Dickson was born in France and educated in England. His father, James Dickson, was a distinguished English painter and lithographer; many artists are numbered in his ancestral roll, among others the great Hogarth. His mother was Miss Elizabeth Kennedy-Laurie, of Woodhall, Kirkcudbright, Scotland, a brilliant scholar, musician, and renowned for her beauty, which has apparently descended to her son. She was a descendant of the Lauries of Maxwellton, immortalized in the celebrated ballad, "Annie Laurie," and the Robertsons, of Strowan, connected with the Earl of Cassilis, the Duke of Athol, and the Royal Family of Scotland.

By W. K. L. Dickson.

A ROW IN A BAR-ROOM.

In his youth young Dickson gave evidence of a strong disposition to electrical experiments. Edison was his favorite scientific hero, and his youthful ambition was not realized until, in 1879, he came to America, and, two years later, although but 21 years of age, attached himself to the great inventor in the capacity of superintendent of the testing and experimental department at the works in Goerck Street, New York. He was prominent in the development of the Electric Light Co., was chief electrician in the Edison Electric Tube Co. of Brooklyn, and was charged with the office of laying the first telegraphic and telephone wires underground in New York City during Mayor Grant's administration.

He is now chief of the electro-mining and kinetographic work at Edison's laboratory in Orange, having matured the magnetic separation of iron and other ores; is co-patentee with Edison of magnetic ore separators, and has completed for the inventor the kinetograph, kinetoscope, and phono-kinetoscope.

In this connection Mr. Edison, in the June number of *The Century*, thus speaks of Mr. Dickson:

"I believe that, in coming years, by my own work and that of Dickson, Muybridge, Marey, and others who will doubtless enter the field, that grand opera can be given at the Metropolitan Opera House at New York without any material change from the original, and with artists and musicians long since dead."

Messrs. Crowell & Co., of New York and Boston, whose specialty in classical *éditions de luxe* is universally recognized, are issuing a magnificently bound and illustrated biography of Edison, written by Mr. Dickson and his sister, Miss Antonia Dickson, which, in the opinion of leading judges, is as notable for wide scientific information as for purity of diction, dramatic force, and lucidity of style. The peculiar advantages enjoyed by the authors in over thirteen years' intimacy with the inventor are shown in the accuracy and varied interest of the biography.

We give herewith some of the kinetograph pictures taken by Mr. Dickson, and a portrait of that gentleman.

W. K. L. DICKSON.

Photography in colors still appears far away from our grasp. The improvements made by the Lumière Bros. upon the Lipmann process are of considerable interest, but it is very doubtful if this method of obtaining colors by interference is ever likely to result in a practical process.

Such have been, as well as we can call to mind, the principal discoveries and improvements during the past twelvemonth. What wonders will the coming year bring forth? Who can tell?

We have, fortunately, men—clever men—among us who are ever trying to invent and to improve. Men who devote their lives to the advancement of photography with but little reward, for who ever heard of a photographic inventor growing rich by his labors? But they work on, satisfied with their efforts to benefit their fellow-creatures and the fascination that always exists in experimental work.

W. E. W.

A happy and prosperous New Year to all!

Photo by Robert L. Bracklow.

MARBLEHEAD.

Standard Formulas

AND

Useful Recipes.

Compiled and Arranged by Prof. Chas. Ehrmann.

PRELIMINARY NOTES.

1. Unless otherwise directed, solids are to be weighed, and liquids to be measured.

2. Unless specially directed otherwise, the *ounce* in the case of solids is understood to be the Troy ounce (= 8 drachms, or = 480 grains). And in the case of liquids, the ounce is understood to be the fluid-ounce, U. S. measure (1 gallon = 8 pints; 1 pint = 16 fl. oz.; 1 fl. oz. = 480 minims.

3. When Acetic Acid is mentioned, that of 36 per cent. strength, spec. gr. 1.048 (U. S. Ph.), is understood.

4. Glacial Acetic Acid is intended to be an acid containing about 85 per cent. of the absolute acid.

5. In accordance with the custom now more and more coming into use, the chemical names of salts are given preferably so that the name of the base is the name of the element itself, and not an oxide of the element. For instance: carbonate of sodium, instead of carbonate of soda; bicarbonate of potassium, instead of bicarbonate of potassa (or potash); sulphite of calcium, instead of sulphite of lime, etc.

6. Instead of giving the strength of certain solutions by the heretofore customary but very confusing method of using two figures with a colon between, for instance, 1:5, which is variously interpreted as meaning either 1 *in* 5, or as 1 *to* 5 (this being then actually 1 in 6), we use in all cases the former expression (1 in 5, 1 in 10, etc.).

Abbreviations.—gr. stands for grains.
Gm. " " gramme.
C.c. " " cubic centimeter.

Standard Formulas and Useful Recipes.

THE WET COLLODION PROCESS.

1.—Negative Collodion.

Ether	¼ fluid ounce
Absolute alcohol	½ fluid ounce
Pyroxyline	5 gr.
Iodide of ammonium	5 gr.
Bromide of cadmium	2 gr.

2.—Ferrotype Collodion (Estabrooke's).

Iodide of ammonium	30 gr.
Iodide of sodium	10 gr.
Iodide of cadmium	20 gr.
Bromide of cadmium	20 gr.
Ether and alcohol (of each)	5 ounces
Pyroxyline, sufficient quantity, say	25 gr.

3.—Collodion for the Reproduction of Line Work (Volkmer's).

Plain Collodion.		*Sensitizer.*	
Ether	700 C.c.	Chloride of calcium	1.6 Gm.
Alcohol	490 C.c.	Iodide of ammonium	4.7 Gm.
Pyroxyline	16 Gm.	Iodide of cadmium	7.8 Gm.
		Absolute alcohol	123 C.c.

After being perfectly dissolved, mix.

4.—Silver Bath for Wet-Plates.

Nitrate of silver	1 ounce
Distilled water	10 ounces

Iodize and acidulate with nitric acid.

5.—Silver Bath for Wet-Plates (Liesegang's).

Nitrate of silver	10 Gm.
Distilled water	150 C.c.

If the bath fogs, add a few drops of iodine solution (1 part iodine to 10 parts of alcohol).

6.—Silver Bath for Ferrotypes (Estabrooke's).

Nitrate of silver	4 ounces
Water	64 ounces
Iodide potassium	2 gr.

Dissolve, sun for three or four hours, filter and acidulate.

7.—Developer for Ferrotypes, by E. P. Grishold.

Protosulphate of iron and ammonia	4 ounces
Water	64 ounces
Acetic acid, 1.048 (U. S. Ph.)	4 ounces
Yellow rock candy	½ ounce

8.—Developer for Wet-Plates.

Sulphate of iron and ammonia	1 ounce
Acetic acid, 1.048 (U. S. Ph.)	1½ ounces
Water	16 ounces

9.—Developer for Hard Negatives (Line Work) Wet-Plates.

Protosulphate of iron	5 Gm.
Water	100 C.c.
Tartaric acid	1 Gm.

10.—Developer for Wet-Plates (Very Intense).

Protosulphate of iron	36 Gm.
Sulphate of copper	12 Gm.
Water	1000 C.c.
Glacial acetic acid, 85 per cent	50 C.c.
Alcohol	40 C.c.

11.—Intensifier for Wet-Plates.

Saturated solution of protosulphate of iron	20 C.c.
Acetic acid, 1.048 (U. S. Ph.)	10 C.c.
Citric acid	5 Gm.
Water	200 Gm.

And silver solution to suit.

12.—Intensifier for Wet-Plates.

Pyrogallic acid	1 Gm.
Citric acid	3 Gm.
Water	80 C.c.

And silver solution to suit.

13.—Intensifier for Line Work, Wet-Plates.

A.—Bromide of potassium	½ ounce
Water	4 ounces
B.—Sulphate of copper	½ ounce
Water	4 ounces

Mix equal parts of A and B, and pour on the film. When perfectly whitened, blacken with solution of nitrate of silver, 30 grains to the ounce.

For greater intensity, use hydrosulphate of ammonia solution, 1 part in 4 parts of water, after the bromide of copper, and thorough washing.

14.—Intensifier for Wet-Plates.

Red prussiate of potash	2 drachms
Nitrate of lead	3 drachms
Water	12 ounces

Immerse the fixed negative till thoroughly whitened; wash, and flood with solution of hydrosulphate of ammonia.

15.—To Strip Collodion Negatives.

The best way to do this is to coat the negative, when dry, with a solution of pure rubber in benzole, and afterwards with leather collodion. When perfectly dry, the edges of the negatives may be cut in, and the plate immersed in a diluted acetic acid solution 1:10. After a short time the film loosens, and may easily be detached from the plate, and turned.

16.—To Rectify a Negative Silver Bath,

Dissolve 1 part of permanganate of potassium in 100 parts of water, and add drop by drop so much of this solution to the bath impregnated with organic matter, till, after vigorously shaking, a slight pinkish color remains.

Sun for several hours, filter and test for neutrality. Acidify with nitric acid.

DRY COLLODION PROCESSES.

17.—Collodio-Bromide Emulsion.

Ether, sp. g. 0.720	5 fluid ounces
Alcohol, sp. g. 0.820	3 fluid ounces
Pyroxyline	50 gr.
Bromide of cadmium and ammonium	80 gr.
(or bromide of zinc	76 gr.)

Sensitize by adding to each ounce 15 grains of nitrate of silver, dissolved in 1 drachm of boiling alcohol mixed with a few drops of water. This is suitable for slow landscape work or transparencies.

18.—Washed Emulsion for Transparencies.

Ether, sp. g. 0.720	5 fluid ounces
Alcohol, sp. g. 0.820	3 fluid ounces
Pyroxyline	60 gr.
Bromide of cadmium and ammonium	100 gr.
(or bromide of zinc.....90 gr.)	
Hydrochloric acid, sp. g. 1.2	8 minims

Sensitize with 20 grains of nitrate of silver to the ounce, dissolved in 2 drachms of boiling alcohol, mixed with just enough water to effect solution. Allow to stand for two or three days.

The emulsion, after being allowed to ripen, should be poured into a dish and set aside to become thoroughly dry. The mass of dry emulsion is then washed, to remove all soluble salts, and is then again dried and redissolved in equal parts of ether and alcohol, at the rate of from 20 to 24 grains to the ounce of the solvents.

19.—Developer for Collodion Emulsion.

A.—Pyrogallol	96 gr.
Alcohol	1 fluid ounce
B.—Bromide of potassium	10 gr.
Water	1 fluid ounce
C.—Stronger ammonia, sp. g. 0.900	1 fluid drachm
Water	15 fluid drachms
or,	
D.—Carbonate of ammonium	2 gr.
Water	1 fluid ounce

For each drachm of developer take, for a normal exposure, 5 minims of A, 1 or 2 minims of B, and 1 or 2 minims of C; or, if D be used, add the above quantities of A, B and C to 1 drachm of D. When the details of the image are out, add double the quantity of B and C.

ALBUMEN PROCESSES.

20.—Gobert's Albumen Process.

Albumen from fresh eggs	26 drachms
Iodide of ammonium	15 gr.
Bromide of potassium	4 gr.
Iodine	4 gr.

Sensitize in

Nitrate of silver	155 gr.
Distilled water	4 ounces
Glacial acetic acid	150 gr.

Albumen plates are developed with saturated solution of gallic acid with a few drops of aceto-nitrate of silver solution (1 in 30).

21.—Whipple & Black's Albumen Honey Process.

Albumen	8 ounces
Honey	7 ounces
Iodide of potassium	3 drachms
Bromide of potassium	20 gr.
Chloride of sodium	10 gr.
Water	2 ounces

Sensitize in bath of the following proportions:

Nitrate of silver	1 ounce
Water	10 ounces
Acetic acid	8 to 10 drachms

For development, see above (No. 20).

GELATINE DRY-PLATE PROCESSES.

22.—W. K. Burton's Gelatine Emulsion.

A.—Bromide of ammonium	260 gr.
Iodide of potassium	20 gr.
Gelatine (Nelson, No. 1)	80 gr.
Distilled water	10 ounces
B.—Silver nitrate	200 gr.
C.—Silver nitrate	200 gr.
Distilled water	1 ounce

Converted to ammonio-nitrate.

D.—Gelatine, hard (dry)	600 gr.

For detailed directions for making the emulsion, see *Photographic Times*, Vol. XVII., page 285.

23.—Burbank's Gelatine Emulsion.

Bromide of ammonium	15 to 20 gr.
Water	1 ounce

or,

Bromide of potassium	18 to 25 gr.
Nitrate of silver, proportioned to the amount of bromide	25 to 30 gr.
Gelatine	30 to 40 gr.

See Burbank's "The Photographic Negative," pages 87–109.

24.—Henderson's Gelatine Emulsion by Ammonia Method.

Dissolve

Bromide of ammonium	308 gr.
Gelatine	50 gr.

Previously swelled

In distilled water	8½ ounces

When cold, add

Water	1¾ ounces
Alcohol	1¾ ounces
Stronger ammonia (0.900)	½ ounce

Next dissolve by heat

Nitrate of silver	462 gr.
In distilled water	3¾ ounces

and add gradually to the gelatine solution. Ripening for twenty-four hours gives sensitiveness to the emulsion. Add, finally, 220 grains of swelled gelatine.

25.—Dr. J. M. Eder's Gelatine Emulsion with Ammonio-Nitrate of Silver.

In distilled water, 10 ounces, dissolve bromide of potassium, 370 grains; add gelatine, 617 grains, previously swelled in water. In distilled water, 10 ounces, dissolve nitrate of silver, 462 grains.

To this solution, cold, add stronger ammonia, drop by drop, until the precipitate first formed is redissolved. Add this gradually to the first solution, and place in a water bath at a temperature of 105 deg. Fahr., for 30 to 45 minutes. Then remove the source of heat, and allow the emulsion to cool down gradually to about 75 deg. Fahr., then pour out to set, and proceed as usual.

DEVELOPMENT OF GELATINE EMULSION PLATES.

26.—Carbutt's Pyro Developer.

No. 1. Pyro Stock Solution.

300 C.c.	Distilled or ice water	10 ounces
1 Gm.	Oxalic acid	15 gr.
2 Gm.	Bromide potassium	30 gr.

Then add Schering's pyro, 1 ounce (30 grammes), and water to make 16 fluid ounces (480 C.c.).

No. 2. Stock Soda Solution.

300 C.c.	Water	10 ounces
60 Gm.	Soda sulphite crystal	2 ounces
60 Gm.	Soda Carb. Crys. (or dry gran. 1 oz)	2 ounces
30 Gm.	Potash Carbonate	1 ounce

Dissolve, and add water to make measure 16 fluid ounces (480 C.c.).

No. 3. Bromide Solution.

14 Gm.	Bromide of sodium or potassium	½ ounce
150 C.c.	Water	5 ounces

Pyro Developer.—Dilute 2 ounces of stock No. 2 with 7 ounces of water for cold weather, and 10 to 12 of water in summer. To 3 ounces of dilute No. 2 add 1½ to 2½ drachms (6 to 10 C.c.) of No. 1. The more pyro the denser the negative, and *vice versa.* No yellowing or fogging need be apprehended if our directions are followed. Development should be continued until the image seems almost buried, then wash and place in fixing bath.

For instantaneous exposures, take for a 5 x 8 or 6½ x 8½ plate 3 ounces of dilute No. 2. Lay the plate to soak in this, and cover pan. Put 2 drachms of No. 1 into the graduate, and 3 drops of bromide solution. Pour the soda solution off of the plate into the pyro and back over the plate; let development proceed, and examine occasionally. Keep solution in gentle motion over the plate. A *very* short exposure may take ten minutes to fully develop. If the image is not fully brought out this time, add to developer in pan three times its bulk of water, and let plate lie in it covered over half an hour or more if necessary, until full development is attained; then wash, and proceed as directed under head of developer

27.—Eikonogen and Hydrochinon Developer (for Carbutt's Orthochromatic Plates, "Celluloid" Films and Transparencies).

A.

Metric Weight.		Avoirdupois Weight.
600 C.c.	Distilled water	20 ounces
120 Gm.	Sulphite of soda crystals	4 ounces
22 Gm.	Eikonogen	330 gr.
10½ Gm.	Hydrochinon	160 gr.
960 C.c.	Water to make up to	32 ounces

B.

Metric Weight.		Avoirdupois Weight.
600 C.c.	Distilled water	20 ounces
60 Gm.	Carbonate of Potash	2 ounces
60 Gm.	Carbonate soda crystals	2 ounces
960 C.c.	Water to make up to	32 ounces

Developer.—For instantaneous exposures, take (30 C.c.) 1 ounce A, (30 C.c.) 1 ounce B, (120 C.c.) 4 ounces water; for portraits, take (30 C.c.) 1 ounce A, (30 C.c.) 1 ounce B, (150 C c.) 5 ounces water; for landscapes, full exposures, sens. 20-27, take (30 C.c.) 1 ounce A, (15 C.c.) ½ ounce B, (90 C.c.) 3 ounces water; for landscapes, full exposures, sens. 16-20, take

(30 C.c.) 1 ounce A. (25 C.c.) ¾ ounce B, (120 C.c.) 4 ounces water; for lantern slides, full exposures, take (30 C.c.) 1 ounce A, (25 C.c.) ¾ ounce B, (120 C.c.) 4 ounces water, and 2 to 6 drops Restrainer D to each ounce of developer.

NOTE.—More of A will increase density, more of B will increase detail and softness. Temperature of developer should not vary much below 65 degs. nor above 75 degs. The after-treatment is the same as with any other developer.

28.—CARBUTT'S EIKONOGEN AND HYDROCHINON DEVELOPER.

A.

600	C.c.	Warm distilled water	20 ounces
120	Gm.	Sulphite soda crystals	4 ounces
4	Gm.	Sulphuric acid	1 drachm
23½	Gm.	Hydrochinon	360 gr.
2	Gm.	Bromide potass	30 gr.
960	C.c.	Water to make up to	32 ounces

B.

60 Gm.	Carbonate potash	2 ounces
60 Gm.	Carbonate soda crystals	2 ounces
960 C.c.	Water to make	32 ounces

C.—*Accelerator.*

30 Gm.	Caustic soda	1 ounce
300 C.c.	Water	10 ounces

For under-exposure, add a few drops of above to developer.

D.—*Restrainer.*

14 Gm.	Bromide potass	½ ounce
150 C.c.	Water	5 ounces

☞ For proportions, see developer above.

29.—CARBUTT'S NEW ACID FIXING AND CLEARING BATH.

4 C.c.	Sulphuric acid	1 drachm
480 Gm.	Hyposulphite of soda	16 ounces
60 Gm.	Sulphite of soda	2 ounces
30 Gm.	*Chrome alum	1 ounce
1920 C.c.	Warm water	64 ounces

Dissolve the hyposulphite of soda in 48 ounces (1440 C.c.) of water, the sulphite of soda in 6 ounces (180 C.c.) of water, mix the sulphuric acid with 2 ounces (60 C.c.) of water, and pour slowly into the sulphite soda solution, and add to the hyposulphite; then dissolve the chrome alum in 8 ounces (240 C.c.) of water and add to the bulk of solution, and the bath is ready. This fixing bath will not discolor until after long usage, and both clears up the shadows of the negative and hardens the film at the same time.

After negative is cleared of all appearance of silver bromide, wash in running water for not less than half an hour to free from any trace of hypo solution. Swab the surface with wad of wet cotton, rinse, and place in rack to dry spontaneously.

30.—CARBUTT'S CLEARING SOLUTION TO REMOVE YELLOW STAIN CAUSED BY DEVELOPER.

600 C.c.	Water	20 ounces
90 Gm.	Sulphate of iron	3 ounces
30 C.c.	Sulphuric acid	1 ounce
30 C.c.	Alum	1 ounce

If, after developing and fixing your negative, it is found to be stained

* N. B.—During cold weather use only half the quantity of chrome alum in above.

yellow from the pyro or hydrochinon developer, first wash well to remove all hyposulphite, then immerse in above solution until the stain is removed; again wash well, and dry.

N. B.—It will improve lantern slides to immerse them for a few minutes in the clearing solution after being well freed from hyposulphite.

31.—Carbutt's Intensifying Solution.

Intensification.—With correct exposure and development, intensification need never be resorted to. The following formula is, however, very effective, and the most permanent of all methods:

No. 1.

16 Gm.	Bichlor. mercury	240 gr.
16 Gm.	Chloride ammonia	240 gr.
600 C.c.	Distilled water	20 ounces

No. 2.

16 Gm.	Chloride ammonia	240 gr.
600 C.c.	Water	20 ounces

No. 3.—*Cyanide-Silver Solution.*

180 C.c.	Distilled water	6 ounces
4 Gm.	Cyanide potass., C. P.	60 gr.
60 C.c.	Distilled water	2 ounces
4 Gm.	Nitrate of silver	60 gr.

Pour the silver into the cyanide solution while stirring, and mark bottle *poison.*

Let the plate to be intensified wash for at least half an hour, then lay in a 5 per cent. solution of alum for ten minutes, and again wash thoroughly; this is to insure the perfect elimination of the hypo. The least trace of yellowness after intensifying shows that the washing was not sufficient.

Flow sufficient of No. 1 over the negative to cover it, and allow to either partially or entirely whiten; *the longer it is allowed to act*, the *more intense* will be the result; pour off into the sink, rinse, and flow over No. 2, and allow to act one minute; wash off, and pour over or immerse in No. 3 until changed entirely to a dark brown or black. No. 3 can be returned to its bottle, but Nos. 1 and 2 had better be thrown away. Wash thorougly and dry.

32.—Wuestner's Developers for New Eagle Lightning, New Orthochromatic and Imperial Non-Halation Plates.

Developing Formula.—These plates can be successfully worked with any good developer. For producing the finest negatives, with shortest possible exposure, we recommend the following "sal soda" developer:

No. 1. *Pyro Stock Solution.*

Water	84 ounces
Sulphite soda crystals	1 pound
Pyrogallic acid	2 ounces
Sulphuric acid, C. P	10 drops

No. 2. *Soda Stock Solution.*

Water	84 ounces
Sal soda (crystals)	8 ounces

Developer.—Take 2 ounces of No. 1, and 2 ounces of No. 2, and add 8 ounces of water.

This developer may be used repeatedly as long as it remains clear. but will work slower and with more intensity when old. Therefore the fresh

developer is best for short exposures, and the old is better if the plate has been full timed. In using the sal soda developer, *it is very important, to carry the development far enough, until the lights have sufficient intensity when examining the plate by transmitted light.*

Over-exposure is corrected by adding to each ounce of developer from 2 to 4 drops of the following solution: Bromide of ammonium, 1 ounce to 10 ounces of water; or by putting the plate into a weak solution of bromide of ammonium (1 to 50 water), before the development has proceeded too far, and then returning it to the developer, to gain sufficient intensity.

If under-exposure is noticed, take the plate out of developer, and, without draining, put into "soda solution"; sufficient developer will remain in the film to develop the shadows, the lights being prevented from gaining too much density in this way.

33.—WUESTNER'S EIKONOGEN DEVELOPER FOR PORTRAITS AND LANDSCAPES.

No. 1.

2400 C c.	Distilled or ice water	80 ounces
115 Gm.	Sulphite of soda (crystals)	3½ ounces
4 Gm.	Oxalic acid	1 drachm
75 Gm.	Eikonogen	2½ ounces
15 Gm.	Yellow prussiate of potash	½ ounce

No. 2.

600 C.c.	Distilled or ice water	20 ounces
60 Gm.	Carbonate of potash	2 ounces

Developer.—Take 4 ounces of No. 1 and ½ ounce of No. 2.

For instantaneous exposures, we recommend the following eikonogen developer:

Dissolve in

300 C.c.	Distilled or ice water	10 ounces
20 Gm.	Sulphite of soda crystals	⅔ ounce
10 Gm.	Carbonate of potash	⅓ ounce

And then add

10 Gm.	Eikonogen	⅓ ounce

Fixing Bath.

Water	100 parts
Sulphite soda (crystals)	5 parts
Sulphuric acid, C. P.	1 part

And add

Hyposulphite of soda	20 parts

This fixing bath cannot be excelled; you will always get a clear and brilliant negative, no yellow stains, a good printing color, and the plate will fix in considerable less time.

After fixing, place the negative in a dish containing a 10 per cent. chrome alum solution; let it remain a few minutes to harden the film, then wash thoroughly.

In tropical climates, we recommend putting the plates in the alum solution before fixing.

34.—WUESTNER'S AMIDOL DEVELOPER.

1000 C.c.	Water	34 ounces
60 Gm.	Sulphite of soda (crystals)	2 ounces
1 Gm.	Bromide of ammonium	15 gr.

Dissolve, and add 4 to 6 grains (from 1 to 1½ drachms) amidol just before using.

For instantaneous exposures, take double the quantity of sulphite of soda (crystals) 120 grammes (4 ounces).

It is advisable to put this developer up in small quantities.

35.—Direction for Working the Cramer Plate.

Eikonogen Developer.

No. 1.

Metric Weights and Measures.		Engl. Measures, Troy Weight.
1200 C.c.	Distilled water .... } Hydrometer test 15.	40 ounces
60 Gm.	Sulphite of sodium crystals	2 ounces
30 Gm.	Eikonogen.....	1 ounce

Boil for a few minutes. After cooling, pour into a bottle and keep it well stoppered.

No. 2.

300 C.c.	Water.....	10 ounces
30 Gm.	Carbonate of potassium	1 ounce

For Use.

90 C.c.	Solution No. 1.....	3 ounces
30 C.c.	Solution No. 2.....	1 ounce

In hot weather, dilute with an equal quantity of cold water. This developer can be used repeatedly by occasionally adding more of Solution No. 1 and 2.

To obtain thin negatives, full of detail, such as are required for printing on Aristo Paper, use the developer more diluted.

For negatives of greater density, add to solution No. 1:

4 Gm.	Hydrochinon	1 drachm

Pyro Developer.

Alkaline Solution.

1800 C.c.	Water.....	60 ounces
150 Gm.	Carbonate of sodium crystals (sal soda)	5 ounces
300 Gm.	Sulphite of sodium crystals.....	10 ounces

A smaller quantity of sulphite will produce a warmer tone, a larger quantity a gray or bluish-black tone.

The alkaline solution must be kept in well-stoppered bottles.

If the negatives show yellow stain, make a fresh solution, or try another lot of sulphite of sodium.

Pyro Solution.

180 C.c.	Distilled or pure ice water.....	6 ounces
1 C.c.	Sulphuric acid.....	15 minims
4 Gm.	Sulphite of sodium crystals.....	1 drachm
30 Gm.	Pyrogallic acid.	1 ounce

All pyro solutions work best while fresh.

8 grains dry pyro may be substituted for 1 drachm of this solution.

Mix in the following proportions:

10 C.c.	Pyro solution.....	1 drachm
80 C.c.	Alkaline solution.	1 ounce
160 C.c.	Tepid water (for winter use).....	2 ounces

or,

240 to 400 C.c.	Cold water (for summer use).....	3 to 5 ounces

Fixing Bath.—The negatives may be fixed in a plain hypo bath, 1 part hyposulphite of soda to 4 parts of water; but the following bath is especially recommended.

Prepare two solutions.

No. 1.

1 kilo	Hyposulphite of soda...	32 ounces
3 liter	Water.....	3 quarts

No. 2.

1 liter	Water.....	1 quart
15 C.c.	Sulphuric acid.....	½ ounce
120 Gm.	Sulphite of sodium crystals.....	4 ounces
90 Gm.	Chrome alum.....	3 ounces

After the ingredients are dissolved, pour No. 2 solution into No. 1.

During the cold season, one-half the quantity of No. 2 is sufficient.

Cramer's Isochromatic Plates are developed and fixed with the same solutions.

36.—Potash Developer for "Harvard" Dry-Plates.

A.—Distilled water	12 ounces
Sulphite of soda (crystals)	2 ounces
Citric acid	60 gr.
Bromide of ammonium	25 gr.
Phrogallic acid	1 ounce

Dissolve separately, mix in order named and filter.

B.—Distilled water	12 ounces
Sulphite of soda (crystals)	2 ounces
Carbonate of potash	4 ounces

Dissolve separately, mix and filter.

The stock solutions must be kept in well stoppered bottles. The pyro stock solution will remain clear and in good order for about a month. It should not be used after it has turned dark and muddy from age.

To develop, mix A, 1 drachm; B, 1 drachm; water, 2 ounces. For detail, add more water; for contrast, more A; for density, more of each, A and B. For instantaneous or short exposures, use double the quantity of water (4 ounces) to begin with; pour off when about half developed, and finish with developer, full strength.

After development, and before fixing, it is well to flow the negative with a saturate solution of alum. Rinse, and fix in the following solution:

Hyposulphite of soda	1 pound
Water	2 quarts

Many prefer to add alum to the fixing solution (about 1 ounce to the above), to which there is no serious objection, provided, always, it is filtered occasionally.

THE "SEED" PLATE.

37.—Pyro Developer.

No. 1.

Pyrogallic acid	1 ounce
Sulphite of soda (crystals)	4 ounces
Water, distilled or good well water	16 ounces

No. 2.

Sal soda	4 ounces
Water	16 ounces

To develop, take

No. 1	1 ounce
No. 2	1 ounce
Water	8 ounces

In warm weather, use more water; in cold weather, less.

Where Aristo Paper is used, the negative must be much thinner and fuller of detail than is required for albumen paper; therefore, take

No. 1	1 ounce
No. 2	1½ ounces
Water	10 ounces

38.—Pyro Developer by Use of Hydrometer.

Make stock solution of sulphite of soda to test 60 with hydrometer; allow to settle perfectly clear, then take

Sulphite of soda solution	16 ounces
Pyro	1 ounce
Sulphuric acid	10 drops

(Or oxalic acid, 10 gr.)

No. 2.

Sal soda solution, hydrometer test 40.

To develop, take

Water	8 ounces
No. 1	1 ounce
No. 2	1 ounce

In warm weather, use more water; in cold weather, less.

Where Aristo Paper is used, the negative must be much thinner and fuller of detail than is required for albumen paper; therefore, take

No. 1	1 ounce
No. 2	1½ ounces
Water	10 ounces

39.—Eikonogen Developer—No. I.

No. 1.

Sulphite of soda (crystals)	3 ounces
Hot water	45 ounces

Thoroughly dissolve, then add

Eikonogen	1 ounce

No. 2.

Sal soda	4 ounces
(Or carb. of potassium, 1¼ ounces.)	
Water	15 ounces

To develop, take of

No. 1	3 ounces
No. 2	1 ounce

Fixing Bath.

Alum	¼ ounce
Hyposulphite of soda	5 ounces
Water	16 ounces

40.—Eikonogen Developer—No. II.

Make stock solution of sulphite of soda, 40 by hydrometer test.

No. 1.

Hot water	30 ounces
Eikonogen	1 ounce

Thoroughly dissolve, then add

Sulphite of soda solution	10 ounces

No. 2.

Sal soda	12 hydrometer test

To develop, take equal parts of Nos. 1 and 2.

Fixing Bath.

Alum	¼ ounce
Hyposulphite of soda	5 ounces
Water	16 ounces

41.—The Following is an Excellent Formula for Producing Strictly White and Black Results, such as is Required for the Reproduction of Printed Matter, Engravings, Etc.

No. 1.

Iodine crystals	4 gr.
Alcohol	1¾ ounces

No. 2.

Bromide of potassium	60 gr.
Water	25 ounces

Add together Nos. 1 and 2, and to develop, add 1 ounce to every 8 or 10 ounces of developer.

To harden the film during development in hot climates, take sulphate of magnesium, 1 ounce; water, 8 ounces; add of this ½ ounce to each 16 ounces of developer.

42.—Para-amidophenol Developer.

Para-amidophenol hydrochlorate	150 gr.
Sulphide sodium in crystals (Andresen's)	1½ ounces
Potassium carbonate	1½ drachms
Water	32 ounces

May be diluted in the proportion of from 1 : 8 to 1 : 12.

43.—Rodinal.

Metabisulphite of potassium	30 Gm.
Para-amidophenol hydrochlorate	10 Gm.
Potassium hydrate	To neutralization
Water	100 Gm.

This developer permits to be diluted in the proportion of 1 : 40.

44.—Amidol Developer.

Dissolve 10 ounces of neutral sodium sulphite in crystals (Andresen's) in 50 ounces of distilled water, and add 1 ounce of amidol. Dissolve, filter quickly, and fill up in small bottles.

For use, dilute with from 2 to 4 volumes of water.

Do not spare bromide of potassium.

45.—Dr. Stolze's Amidol Developer.

A.—Distilled water	100 Gm.
Potassium metabisulphite	25 Gm.
Amidol (Andresen's)	5 Gm.
B.—Distilled water	100 Gm.
Potassium bicarbonate	20 Gm.

To 100 C.c. of water add 10 C.c. of A, and of B from 5 to 50 C.c., according to time of exposure. For normal exposures, 20 C.c. are sufficient.

Do not apply the solution till effervescence has ceased.

46.—Crystallos.

Sodium sulphite cryst	8 ounces
Ferrocyanide potassium	2½ ounces
Hydrochinon	1½ ounces
Caustic potash solution (75 per cent)	2 ounces
Distilled water	28 ounces

Dissolve the first three substances in 20 ounces of water, then add the caustic potash solution, finally the rest of the water. The Paris crystallos is tinted red with aniline dye, which, however, has no influence upon its action.

Dilute the solution with from 1 to 5 and 8 volumes of water.

47.—Potash Developer for Gelatine Dry-Plates (Dr. Stolze's).

Modified by Dr. Eder.

A.—Carbonate of potassium	90 Gm.
Sulphite of sodium, cryst	25 Gm.
Water	200 C.c.
B.—Water	100 C.c.
Sulphite of sodium, cryst	25 Gm.
Pyrogallol	12 Gm.

Mix 40 minims of A with 50 minims of B and 100 C.c. of water.

Bromide of potassium should be used only in minimal quantities, 1 to 3 minims (of a 10 per cent. solution); with more, the general sensitiveness is much reduced.

An alum bath mixed with an equal volume of saturated sulphate of iron solution increases the density, and gives the plate a good printing quality.

48.—Soda Potash Developer for Gelatine Dry-Plates (New York Amateur Club).

Ferrocyanide of potassium	1½	ounces
Carbonate of potassium	1½	ounces
Gran. carb. of sodium	1	ounce
Cryst. sulphite of sodium	2	ounces
Hot distilled water	10	ounces

49.—Soda Developer in One Solution for Gelatine Dry-Plates (Eder's Formula).

Crystallized sulphite of sodium	5	drachms
Carbonate of sodium	2½	drachms

Dissolve in 2 ounces of boiled distilled water, and, after having cooled down, add 46 grains of pyro. Keep in well-stoppered bottles, and for use dilute with five times its bulk of water.

50.—Ferrous-Oxalate Developer for Gelatine Dry-Plates (Dr. Eder's).

A.—Neutral oxalate potassium	200 Gm.
Distilled water	800 C.c.

Acidulate with oxalic acid.

B.—Protosulphate of iron, cryst.	100 Gm.
Distilled water	300 C.c.
Sulphuric acid	5 minims
C.—Bromide of potassium	10 Gm.
Distilled water	100 C.c.
D.—Hyposulphite of sodium	2 Gm.
Distilled water	200 C.c.

Mix immediately before use 3 volumes of A with 1 volume of B, and develop. Restrain with a few drops of C.

For over-exposure, take less of the iron solution, and add gradually in small portions, as required. To give the negative body, use C.

To make soft negatives with fine detail, take of

A	250 C.c.
B	50 C.c.
C	40 minims
D	16 minims

Plates giving with ordinary developer hard and glassy negatives, give with this modification very satisfactory results.

51.—"Chautauqua" Developer, with Ammonia, for Gelatine Dry-Plates.

A.—Bromide ammonium	¼	ounce
Water	8	ounces
B.—Stronger ammonia (0.900)	1	ounce
Water	7	ounces
C.—Pyrogallol	1	drachm
Nitric acid	5	minims
Water	12	ounces

Take for correct exposure of A 40 minims, of B 20 minims, of C ½ ounce, and 2 ounces of water.

52.—"Chautauqua" Developer, with Carbonate of Sodium, for Gelatine Dry-Plates.

A.—Dissolve 3 ounces of granulated sulphite of sodium and ¼ ounce of meta-bisulphite of potassium in 32 ounces of distilled water, and add 1 ounce of pyrogallic acid.

Keep in well stoppered bottles.

B.—Dissolve 8 ounces of granulated, or 16 ounces of crystallized, carbonate of sodium (common washing soda), in water enough to make a bulk of 32 ounces.

Mix 1 ounce of water with 1 drachm of A, add a few drops of B, and increase gradually till development proceeds regularly. If necessary, restrain with 10 per cent. solution of bromide of potassium.

53.—"Chautauqua" Developer, with Carbonate of Potassium, for Gelatine Dry-Plates.

A.—Pyro	1 ounce
Sulphite of sodium, granulated	2 ounces
Bromide of potassium	80 gr.
Citric acid	60 gr.
Water	12 ounces
B.—Water	12 ounces
Sulphite of sodium, granulated	1 ounce
Carbonate of potash	3 ounces

1 drachm of each—A and B—to 1 ounce of water, make the developing solution.

54.—"Chautauqua" Developer, with Hydrochinon, for Gelatine Dry-Plates.

A.—Hydrochinon	¼ ounce
Sulphite of sodium, granulated	1 ounce
Meta-bisulphate of potassium	30 gr.
Water	16 ounces
B.—Carbonate of potassium	1½ ounces
Water	16 ounces

55.—"Chautauqua" Hydrochinon Developer in One Solution.

Hydrochinon	½ ounce
Sodium sulphite, granulated	2 ounces
Potassium carbonate	2 ounces
Water	32 ounces

For use, dilute 1 volume with 3 volumes of water.

56.—"Chautauqua" Developer with Eikonogen in Two Solutions.

A.—Eikonogen	128 gr.
Crystallized sulphite of sodium	1 ounce
Dissolve in warm water	16 ounces
B.—Crystallized carbonate of sodium	1½ ounces
Water	10 ounces

For normal exposures, take 3 parts of A and 1 part of B. To promote intensity, add a few drops of a 10 per cent. solution of bromide of potassium.

57.—"Chautauqua" Developer with Eikonogen. (In one solution, for instantaneous work.)

Eikonogen	120 gr.
Crystallized sulphite of sodium	1½ ounces

Dissolve in 8 ounces of hot water and add carbonate of potassium 120 grains.

For use, dilute with an equal bulk of water, and add a few drops of a 10 per cent. solution of bromide of potassium.

58.—"Chautauqua" Ferrous Oxalate Developer. See No. 50.

59.—"CHAUTAUQUA" DEVELOPER, WITH HYDROCHINON, FOR GELATINE DRY-PLATES.

A.—Hydrochinon	120	gr.
Sulphite of sodium, granulated	1	ounce
Meta-bisulphate of potassium	30	gr.
Water	16	ounces
B.—Carbonate potassium	1½	ounces
Water	16	ounces

Take equal parts for normal exposures. For over or under-exposures, proceed as with pyro.

60.—DEVELOPER FOR GELATINE FERROTYPES (Phœnix Plates).

A.—Pyrogallol	1 drachm
Water	12 ounces
Nitric acid	5 drops
B.—Water	12 ounces
Bromide potassium	4 drachms
Aqua ammonia fort	4 fluid drachms
Nitrate potassium	3 fluid drachms
Chlorate potassium	1 fluid drachm
White rock candy	1 fluid drachm

For use, take of A 1 drachm, of B 3 drachms, to 1½ ounces of water. Fix in cyanide of potassium, 1 in 20.

61.—THE ACID FIXING AND CLEARING BATH.

Add 2 ounces of S. P. C. Clarifier (acid bisulphite of sodium) solution to 1 quart of hypo solution 1 in 5.

62.—COMBINED ALUM AND HYPO BATH.

Add saturated solution of sulphite of sodium to saturated solution of alum till the white precipitate formed remains undissolved, and when the odor of sulphurous acid becomes perceptible.

Mix this solution with an equal bulk of freshly-prepared hypo solution 1 in 5, and filter.

This bath will remain clear.

63.—CLEARING SOLUTION (EDWARD'S).

Alum	1 ounce
Citric acid	1 ounce
Sulphate of iron, crystals	3 ounces
Water	20 ounces

This should be freshly mixed.

64.—BELITZKI'S METHOD FOR REMOVING THE LAST TRACES OF HYPO.

Chloride of Lime	20 Gm.
Water	1 liter

Add to the milky liquid

Sulphate of zinc	40 Gm.

dissolved in from 80 to 100 C.c. of water; shake well and decant.

The clear, supernatant solution of hypochlorite of zinc is kept in well-closed bottles; 1 part of it mixed with 60 parts of water will remove the last traces of fixing soda.

The solution remains active as long as it smells of hypochlorous acid.

65.—TO REMOVE HYPO FROM FILMS.

A solution of bromine in water, about 1 in 30, destroys the hypo in a gelatine film.

66.—Carbutt's Intensifier.

No. 1.

Bichloride of mercury	240 gr.
Chloride of ammonium	240 gr.
Distilled water	20 ounces

No. 2.

Chloride of ammonium	480 gr.
Water	20 ounces

No. 3.

Sulphite of sodium (cryst.)	1 ounce
Water	9 ounces

Let the plate to be intensified wash for at least half an hour, then lay in alum solution for ten minutes, and again wash thoroughly; this is to insure the perfect elimination of the hypo. The least trace of yellowness after intensifying shows that the washing was not sufficient.

Flow sufficient of No. 1 over the negative to cover it, and allow to either partially or entirely whiten; *the longer it is allowed to act* the *more intense* will be the result; pour off into the sink, then flow over No. 2, and allow to act one minute; wash off, and pour over or immerse in No. 3 until changed entirely to a dark brown or black. No. 3 can be returned to its bottle, but Nos. 1 and 2 had better be thrown away. Wash thoroughly and dry.

67.—Intensifier, with Mercury and Ammonia, for Gelatine Dry-Plates.

Pour over the well-washed negative a saturated solution of mercuric chloride (bichloride of mercury); do not keep it on too long, unless the negative is very thin. Wash well, and immerse in bath of

Water	10 ounces
Ammonia	10 minims

Leave the plate in this solution until the black color goes quite through the film. Wash well.

68.—Intensifier (Mercuric) with Sodium Sulphite, for Gelatine Dry-Plates.

Whiten the negative in the saturated solution of mercuric chloride, wash and blacken with a solution of sulphite of sodium 1 in 5. Wash well.

The reduction is perfect, with a positive black tone.

69.—Intensifier with Iodide of Mercury.

Dissolve 1 drachm of bichloride of mercury in 7 ounces of water and 3 drachms of iodide of potassium in 3 ounces of water, and pour the iodide solution into the mercury till the red precipitate formed is completely dissolved.

For use, dilute with water, flow over the negative till the proper density is reached, and wash, when the deposit will turn yellow. Remove the yellow color by flowing a 5 per cent. solution of hypo over the plate, and give it the final washing.

70.—Intensifier for Gelatine Dry-Plates with Mercuric Chloride and Hydrochinon (Dr. Mallman).

After whitening in the saturated solution of mercuric chloride, as usual, treat with an old hydrochinon developer; the result is a bluish-black intensification, which is applicable to positives as well as negatives.

71.—Intensifier, with Cyanide of Silver, for Gelatine Dry-Plates.

Mr. J. E. Thompson gives the following: After fixing and washing the plate well, place it in a solution of

Bichloride of mercury	10 gr.
Chloride of ammonium	10 gr.
Water	1 ounce

for a few seconds, until it bleaches. Then wash and place in a bath of cyanide of silver until it blackens, made as follows:

Cyanide of potassium	2 ounces
Distilled water	48 ounces
Nitrate of silver	1 ounce
Distilled water	6 ounces

Pour the silver solution gradually into that of the cyanide, stirring with a glass rod. The quantities given are about right to form a precipitate which will re-dissolve afterward. To be used when a few days old.

72.—Reducer for Gelatine Dry-Plate Negatives (Farmer's).

Sat. sol. of ferricyanide of potassium	1 part
Hyposulphite of sodium solution, 1 in 10	10 parts

73.—Reducer for Gelatine Dry-Plates.

Perchloride of iron	30 gr.
Citric acid	60 gr.
Water	1 pint

74.—Belitski's Acid Ferri-Oxalate Reducer for Gelatine Plates.

Water	7 ounces
Potassium ferric oxalate	2½ drachms
Crystallized neutral sulphite of sodium	2 drachms
Powdered oxalic acid, from	30 to 45 gr.
Hyposulphite of soda	1½ ounces

The solution must be made in this order, filtered, and be kept in tightly-closed bottles; and as under the influence of light the ferric salt is reduced to ferrous, the preparation must be kept in subdued light.

75.—To Reduce Intensity of Negatives.

Rub the parts to be reduced with a soft rag, moistened with alcohol, till the density is softened down. For sharply defined outlines, use a pointed stick of soft wood dipped in alcohol.

The method may be well applied for the brightening up of flare spots and halation marks.

ORTHOCHROMATIC METHODS BY BATHING.

76.—Orthochromatic Dry-Plates—F. Ives' Chlorophyll and Eosine Process.

Use any good bromide collodion emulsion that contains no free nitrate of silver. Flow plate as usual, and as soon as the emulsion film sets, flow several times with strong alcoholic solution of chlorophyll from blue myrtle, or plantain leaves; then immerse in water strongly tinted with blue shade eosine, and keep in motion until smooth.

Sensitizes for all colors, including deep ruby red; a very light-yellow screen is sufficient to secure correct rendering of color-tone.

77.—Orthochromatic Dry-Plates—V. Schumann's Cyanine Bath.

Soak the plate in 200 C.c. of water and 2 to 4 C.c. of stronger ammonia for two or three minutes, then immerse in

Distilled water	200 C.c.
Alcohol	10 C.c.
Stronger ammonia (0.900)	4 C.c.
Alcoholic solution of cyanine, 1 in 500	10 C.c.

78.—Orthochromatic Dry-Plates—The Chautauqua Erythrosine Bath.

Preliminary Bath.

A.—Water	200 C.c.
Stronger ammonia	2 C.c.

Soak the plate for two minutes.

Color Bath.

Erythrosine solution, 1 in 1000	25 C.c.
Stronger ammonia (0.900)	4 C.c.
Water	175 C.c.

The plate should not remain longer in this bath than one and a quarter minutes.

79.—Obernetter's Method with Nitrate of Silver.

Distilled water	480	C.c. =	16	fluid ounces
Nitrate of silver	1.25	Gr. =	20	gr.
Ammonium carbonate	5	Gr. =	75	gr.
Erythrosine solution (1 in 500)	35	C.c. =	1⅛	fluid ounces
Stronger ammonia (0.900)	4	C.c. =	1	drachm

Bathe the plate in the preliminary solution (see No. 78) for 150 seconds. Without washing flow the sensitizing solution over the plate twice, and dry in the dark closet.

80.—To Prepare Yellow Glass Screens.

Take of crushed (not powdered) curcuma root, 2 ounces, and macerate in 10 ounces of alcohol for three days. After filtering the tincture, mix with an equal bulk of ether, and add to each ounce of the mixture 6 grains of gun cotton.

With this collodion coat a plane parallel glass plate, which must be perfectly white, thin, and without any curvature.

VARNISHES.

81.—Negative Varnishes.

Sandarac	4 ounces
Alcohol	24 ounces
Oil of lavender	3 ounces
Chloroform	5 drachms

82.—Negative Varnish.

White hard varnish	15 ounces
Alcohol	25 ounces

This will be found a good and cheap varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off. Very suitable for enlarged negatives that are not to be retained.

83.—Negative Varnish.

Tough, hard and durable.

Shellac	1¼ ounces
Mastic	¼ ounce
Oil of turpentine	¼ ounce
Sandarac	2¼ ounces
Venice turpentine	¼ ounce
Camphor	20 gr.
Alcohol	20 fluid ounces

84.—Negative Varnish.

Sandarac	90 ounces
Venice turpentine	36 ounces
Oil of lavender	10 ounces
Alcohol	500 fluid ounces

85.—Standard Photographic Varnish.

White shellac	8 ounces
Orange shellac	4 ounces
Sandarac	1 ounce
Alcohol	60 fluid ounces

86.—Retouching Medium.

Dammar	70 gr.
Yellow resin	6 drachms
Oil of turpentine	4 ounces

87.—Negative Retouching Varnish.

Sandarac	1 ounce
Castor oil	80 gr.
Alcohol	6 ounces

First dissolve the sandarac in the alcohol, and then add the oil.

88.—Ground-Glass Varnish.

Sandarac	90 gr.
Mastic	20 gr.
Ether	2 fluid ounces
Benzol	½ to 1½ fluid ounces

The proportion of the benzole added determines the nature of the mat obtained.

89.—Encaustic Paste.

Pure white wax	500 parts
Elemi	10 parts
Benzol	200 parts
Oil of lavender	300 parts
Oil of spike	15 parts

PRINTING AND TONING ON ALBUMENIZED, PLAIN AND OTHER PAPERS.

90.—The Silver Printing Bath.

Silver nitrate	50 gr.
Water	1 ounce

Neutralize with carbonate of silver.

91.—Modified Silver Bath.

Silver nitrate	50 gr.
Ammonium nitrate or magnesium nitrate	50 gr.

To secure a neutral state of the bath, a little carbonate of silver should be kept at the bottom of the stock bottle.

92.—The Price Toning Formula.

Into 7½ ounces of water dissolve 15 grains chloride of gold and sodinm, then add to it 300 grains of acetate of soda and 7 drops of a saturated solution of chloride of lime.

This stock solution should be prepared at least twenty-four hours before being used. Take ½ ounce of it and mix with 5 ounces of water.

93.—The Photographic Times Toning Bath.

Into 7½ ounces of water put 7½ grains chloride of gold and sodium. Label the bottle containing the mixture: *Chloride of gold solution.* Combine 6 ounces of water with 1 ounce *of French azotate*, to which add 1½ ounces of the chloride of gold solution.

94.—Borax Toning Bath.

Chloride of gold solution, 1:50	3 C.c.
Borax solution, 1 to 10	100 C.c.
Water	100 C.c.

Can be used immediately.

95.—The Chautauqua Toning Bath.

Dissolve 15 grains of chloride of gold and sodium in 15 ounces of water. Take of this solution 3 ounces, pour it in the toning tray, test for acidity with litmus paper, and *neutralize* with bicarbonate of soda, and add 30 grains of acetate of sodium and 30 ounces of water. Prepare the solution an hour before using it.

If warm tones are wanted, add a little acetic acid to the last washing water.

For this bath the sensitizing silver should be neutral, for which purpose a small portion of carbonate of silver should be kept in the silver stock bottle.

96.—Charles W. Hearn's Toning Baths.

With Sal Soda.

Distilled water	64 ounces
Acid sol. of chloride of gold (4 grains to 1 ounce)	1 ounce
Saturated solution of carbonate of sodium cryst.	½ ounce

Should be prepared half an hour before use.

With Chloride of Lime.

Water	40 ounces
Chloride of lime	5 gr.
Chloride of gold	4 gr.

97.—Abney and Robinson's Toning Baths.

Chloride of gold	1 gr.
Sodium carbonate	10 gr.
Water	10 ounces

Should be used immediately after mixing. This bath gives purple and black tones.

98.—With Chalk and Chloride of Lime.

Chloride of gold	2 gr.
Saturated sol. of chloride of lime	2 drops
Chalk	1 pinch
Water	16 ounces

The bath should be prepared with hot water, and be kept for one day before using it.

99.—Dr. Liesegang's Toning Bath.

With Tungstate of Sodium.

Tungstate of sodium	20 Gm.
Boiling water	1 liter
Chloride of gold	1 Gm.

100.—Dr. Liesegang's Toning Bath.

With Phosphate of Sodium.

Phosphate of sodium	15 Gm.
Chloride of gold	1 Gm.
Water	1 liter

101.—Dr. Liesegang's Toning Bath.

With Carbonate of Lime (Chalk).

Chloride of gold	1 Gm.
Carbonate of sodium	15 Gm.
Chalk	5 Gm.
Water	1 liter

After twelve hours the bath is perfectly clear and colorless, when it is ready for use. It is very durable, and gives fine tones.

102.—Toning Bath for Ready Sensitized Paper.

A.—Chloride of gold	1 Gm.
Water	1 liter
B.—Borax	10 Gm.
Tungstate of sodium	40 Gm.
Water	1 liter

103.—Printing on Plain Paper.

Prepare the plain paper with

Ammonium chloride	60 to 80 gr.
Sodium citrate	100 gr.
Sodium chloride	20 to 30 gr.
Gelatine	10 gr.
Distilled water	10 ounces

or,

Ammonium chloride	100 gr.
Gelatine	10 gr.
Water	10 ounces

The gelatine is first swelled in cold water and then dissolved in hot water, and the remaining components of the formula are added. The solution is filtered, and when still warm the paper floated upon it for three minutes.

The salted paper is sensitized upon a neutral 45-grain silver bath.

104.—Red Prints for Photo-Engravers.

Citric acid	100 gr.
Ammonium chloride	100 gr.
Gelatine	10 gr.
Water	10 ounces

Dissolve the citric acid in a small portion of water, and exactly neutralize with carbonate of soda (228 grains of common washing soda are required).

Float the paper on this bath for one to two minutes, and sensitize upon a 50-grain nitrate of silver solution. Fix in fresh hypo, without toning.

105.—Platinum Toning Bath, for Plain Silver Prints.

Chloroplatinite of potassium	1 Gm.
Water	1 liter
Nitric acid	5 to 10 drops

106.—Toning Silver Prints After Fixing (Pizzighelli).

Ammonium sulphocyanate	300 Gm.
Gold chloride	3 Gm.
Potassium hydrate	3 Gm.
Water	1000 Gm.

107.—How to Print on Whatman's Drawing Paper.

Salt the paper in

Water	560 Gm.
Arrowroot (boiled)	18 Gm.
Ammonium chloride	16 Gm.

by floating. Dry in horizontal position, and sensitize with a

Silver nitrate solution.....60 Gm. to 240 Gm. of water

to which

Citric acid.....25 Gm. in 240 Gm. of water

is added.

Print till a metallic lustre appears in the deeper shadows.

Tone with

Chloroplatinite of potassium	4 Gm.
Water	560 Gm.
Nitric acid	1 to 2 Gm.

Fix in the ordinary hypo bath made alkaline with a few drops of ammonia.

The resulting tones are of a warm brown, when, adding sodium bisulphite to the hypo, the color will turn to a positive black.

108.—Pizzighelli's Platinum Paper.

1.—Chloroplatinite of potassium	10 Gm.
Distilled water	60 Gm.
2.—Ferric oxalate	20 Gm.
Oxalic acid	1.5 Gm.
Water	100 Gm.
3.—2 per cent. solution of chlorate potassium	0.4 Gm.

For use, mix of

1	48 Gm.
2	30 Gm.
3	8 Gm.
Water	8 Gm.

The paper is coated with this solution by means of brusn, sponge or cotton tuft.

Dry quickly without the application of heat, and keep the sensitive paper in a box and free from moisture.

When sufficiently exposed, develop with

Oxalate potassium	140 Gm.
Water	500 Gm.

acidified slightly with oxalic acid.

Fix in 1 part of hydrochloric acid and from 60 to 80 of water; finally wash.

The acid fixing bath should be applied three or four times successively.

When adding to the above developer from 1 to 2 Gm. of mercuric chloride, the otherwise black tone will change to an agreeable brown.

ARISTOTYPE OR CHLORIDE OF SILVER COLLODION AND CHLORIDE OF SILVER GELATINE PRINTING

109.—Aristotype, or Chloride of Silver Collodion.

A.—Nitrate of silver	8 Gm.
Alcohol	100 C.c.
B.—Chloride of strontium	2 Gm.
Alcohol	100 C.c.
C.—Citric acid	5 Gm.
Water	100 C.c.
D.—Ether	100 C.c.
Gun cotton	4 Gm.
Alcohol	100 C.c.

To 100 C.c. collodion (D) add first, by constant agitation, 10 C.c. of B and 10 C.c. of C; finally add 5 C.c. of A by vigorously shaking the mixture. The resulting emulsion is allowed to settle for twenty-four hours, and is then used for coating paper.

110.—Chloride of Silver Collodion (Geldmacher's).

Solution 1.

Gun cotton	6½	fluid drachms
Ether	15	fluid ounces
Alcohol	15	fluid ounces
Castor oil	1	drachm

Solution 2.

Nitrate of silver	5 drachms	8 gr.
Water		6 drachms
Alcohol		1½ ounces

Dissolve in a warm water bath.

Solution 3.

Citric acid	1 drachm	15 gr.
dissolved in		
Alcohol		2½ ounces
and		
Chloride of strontium	1 drachm	15 gr.
dissolved in		
Alcohol		2½ ounces

Make the two solutions separately and mix.

After all the solutions have been made, add No. 3 to No. 1, shake vigorously, and by subdued light add gradually, and in small portions at a time, the No. 2 solution by constant agitating.

After an hour's ripening, the collodion emulsion is ready for use.

The paper to be coated must be furnished with a substratum of sulphate of barium and gelatine.

111.—Woodbury's Formula for Gelatine Aristotypes.

Water	8	ounces
Silver nitrate	¼	ounce
Rochelle salts	20	gr.
Ammonium chloride	10	gr.
Alum	50	gr.
Citric acid	1	drachm
Gelatine	1	ounce

Dissolve the gelatine in 6 ounces of water, the silver nitrate and the citric acid in 1 ounce of water, and the salts and alum in another ounce of water; add latter solution to gelatine, and stir well and pour in the silver solution gradually.

112.—Liesegang's Toning Bath for Aristotypes.

A.—Water	20 ounces
Sulphocyanate of ammonium	1 ounce
Alum	1 ounce
Saturated solution of carbonate of ammonium	20 drops
B.—Water	50 ounces
Chloride of gold	15 gr.

113.—A. Stieglitz's Toning Bath for Aristotypes.

1.—Phosphate of sodium	3 drachms
Water	32 ounces
2.—Chloride of gold	15 gr.
Water	16 ounces

Mix. Allow to stand for twenty-four hours.

114.—Liesegang's Combined Toning Bath.

Water	32 ounces
Hyposulphite of sodium	8 ounces
Sulphocyanate of ammonium	1 ounce
Acetate of sodium	½ ounce
Saturated solution of alum	2 ounces

and

Water	8 ounces
Chloride of gold	15 gr.
Chloride of ammonium	30 gr.

Pour the gold solution into the hypo solution, then add 30 grains of freshly prepared chloride of silver.

115.—Combined Fixing and Toning Bath for Chloride of Silver Gelatine Paper.—Dr. F. Stolze's.

Hyposulphite of sodium	35 Gm.
Common salt	9 Gm.
Alum	4 Gm.
Sulphocyanate of ammonium	2 Gm.
Water	150 to 200 C.c.

The compound will have matured for use in four to eight days.

Decant the clear solution from the deposit formed and filter. Immediately before use, add to above quantity, 2 C.c. chloride of gold solution 1 in 100. If the solution does not act with sufficient energy, a few C.c. of saturated alum solution may be added.

116.—Bradfisch & Pierce Aristotype and Matt Surface Paper.

Gold Toning Bath.

Water	32 ounces
Bicarbonate of soda	20 gr.
Citrate of sodium	20 gr.

Dissolve and add a few drops of gold stock solution (1 grain to the ounce).

Use distilled water, if possible. Allow bath to stand one hour; then add 1 grain of gold in solution; place twenty-five to thirty prints in bath, and tone until the half tones and high lights are cleared, showing a bluish tint by transmitted light. Some of the red in the shadows must be left in the print, or the same will be overtoned. Never add gold when prints are in bath, or attempt to tone more than twenty-five or thirty prints in a batch. They should be kept under perfect control, and the amount of gold proportioned so as to tone in not less than seven or eight minutes. If prints are smoky, reduce the bicarbonate of soda to 25 grains. This bath can be used repeatedly by the addition of a small amount of bicar-

bonate of soda from time to time, and gold enough to tone; as soon as it becomes discolored, it should be thrown away. After toning, place prints in fresh water to which a little salt has been added; then rinse in one change of clear water, and place in following

Fixing and Hardening Bath.

Cold water	1 gallon
Hypo	6 ounces
"B. P." hardener	1 ounce

This bath can be used repeatedly until it becomes muddy. Fix from fifteen to twenty minutes.

117.—Bradfisch & Pierce Combined Toning and Fixing Bath.

Stock Solution A.

Water (cold)	1 gallon
Hypo	1 pound

Stock Solution B.

Water (cold)	15 ounces
Chloride of gold	15 gr.
Acetate of lead (crystals)	1 ounce

For Use.—Shake B well (do not filter), and add 6 ounces of B to half a gallon of A, stirring as added. Then add 2 ounces of "B. P." Hardener, and bath is ready for use.

For warm weather, mix fresh and cold before use; for cold weather, mix twenty-four hours before use.

118.—Bradfisch & Pierce N. Y. Aristotype Paper.

For Warm Sepia Tones.

Water	8 ounces
Solution A (15 grains gold to 8 ounces water)	½ ounce

Add bicarbonate of soda enough to make alkaline.

This bath should be made up one hour before using.

For Purple Tones.

Water	8 ounces
Acetate soda	15 gr.
Solution A (15 grains gold to 8 ounces water)	½ ounce

Add bicarbonate of soda enough to make slightly alkaline.

This bath should be made up one hour before using, and can be used repeatedly by the addition of gold solution as its action becomes slower.

For Brown Tones. No. 1.

Water	16 ounces
Borax	80 gr.
Tungstate soda	⅔ ounce

Add neutral gold enough to tone.

No. 2.

Soak the prints in a saturated solution of camphor water for fifteen minutes, wash and tone in

Water	20 ounces
Phosphate soda	150 gr.

Add neutral gold enough to tone.

Fixing Bath.

Water	20 ounces
Hypo	1 ounce
Common alum	1 ounce

119.—Kalona Aristo (a Collodio-Chloride Paper).

Any one of the following toning baths will be found to give good results.

No. 1.

Water	48 ounces
Acetate soda	75 gr.
Borax	75 gr.

Add neutral gold enough to tone.

No. 2.

Water	48 ounces
Phosphate soda	90 gr.

Add neutral gold enough to tone.

No. 3.

Water	48 ounces
Tungstate soda	150 gr.

Add neutral gold enough to tone.

Fixing Bath.

Hypo	3 ounces
Water	64 ounces

Fix not less than fifteen minutes, keeping prints in constant motion. After prints are taken from fixing bath, a thorough rinsing in four or five changes of water is necessary to remove the excess of hypo before placing in trays or tanks for final washing.

The complete elimination of hypo from the prints is absolutely necessary, for any of it remaining causes discoloration.

120.—C. E. Hopkins's Omega Papers.

Separate Toning and Fixing for Omega Paper.—Print about the same as albumen paper. Wash through five or six changes of water, having the first two thoroughly alkali.

Have prepared the following solutions :

Borax (saturated solution)	1 to 12	ounces water
Acetate of soda (saturated solution)	1 to 3	ounces water
Hypo soda (saturated solution	1 to 1½	ounces water
Alum (saturated solution)	1 to 10	ounces water

For toning, use gold solution, 1 ounce; water 20 to 60 ounces; borax solution, to make nearly neutral; acetate of soda solution, 2 to 4 drachms.

Tone to nearly the desired tone, and place in plenty of water slightly acidified with acetic acid; rinse well, and fix from fifteen to thirty minutes in hypo solution, 9 to 12 ounces; borax solution, 3 to 6 ounces; liquid acid sulphite of soda, 1 drachm; alum solution, 10 to 20 ounces; water to make 1 gallon. The acid sulphite, added before the alum, prevents any precipitation. Time the fixing according to the depth of printing, tone, etc. If the high lights are clear and the print light enough, and the tone not too warm, take out in fifteen minutes; otherwise, leave in longer and strengthen the bath. The strength of the toning bath should be regulated to suit the strength of the paper, fresh paper toning much easier than old. Toning should occupy about ten minutes, and strength of bath regulated to that time.

Handle prints face down in all of the processes, and keep them moving; wash very thoroughly after fixing; mount, retouch and burnish in the ordinary way. For cleaning the surface of the prints after they are dry, use alcohol and a soft, clean cloth. In cool weather, and prints in ordinary condition, the smaller quantities indicated in the formula are sufficient; but more alum may be required in warm weather, in which case use more borax and hypo also. In case the high lights do not clear up in a reasonable time, the fixing bath should be strengthened.

Combined Bath for Omega Paper.

Hot water	1 gallon
Hypo soda	12 ounces
Borax	1 ounce
Alum	4 ounces

Dissolve thoroughly; place in evaporating dish; heat to near the boiling point (180 degs.); let cool, and filter. For use, to each 32 ounces add 1 drachm of an 8-grain solution acetate of lead, and 1 grain of gold. This ought to tone in about ten to fifteen minutes. If it should tone more rapidly than ten, add more of the stock solution; but if more slowly than fifteen, add a little more gold. Do not wash the prints previous to toning, but place them dry into the bath, one at a time, being careful to manipulate them briskly, and break all air bubbles. Do not place too many prints in the bath at once, and do not try to tone too many in a given quantity of solution. One quart of the bath will tone and fix from forty to fifty cabinets. Do not try more. Throw this away and use fresh. Should the film become soft, rinse through two or three changes of water, and soak them a few minutes in a plain bath of alum, about 4 ounces to the gallon. It is surprising what beautiful tones may be produced by this process—no indication of that "double tone" so common in combined baths. Stop the tone very nearly where you want it, as there is very little change in drying. If there is any inclination to stick to the rubbing-down paper, use a soft, wet sponge.

121.—Chautauqua (Ehrmann's) Combined Toning and Fixing Bath.

Dissolve

Hyposulphite of soda	16 ounces

in

Water	31 ounces

Also dissolve

Alum	3 ounces

in

Water	31 ounces

Mix the two solutions and allow to stand for several days in an open jar or vessel till all sulphurous acid has evaporated. Then filter, and add 22 grains of nitrate of lead previously dissolved in water.

To 18 ounces of this solution add 5 grains of pure terchloride of gold dissolved in 2 ounces of water.

The gold solution should be added in small portions at a time, by constant stirring with a glass rod.

Twenty ounces of this bath will tone fifty 5 x 8s of any kind of aristo (chloride of silver emulsion) prints, but not more.

The best results were had upon Bradfisch Improved Aristo Paper.

PRINTING ON SUBSTANCES OTHER THAN PAPER.

122.—Collodion for Porcelain Pictures.

Fennemore's Method.

A.—Negative gun cotton	60 gr.
Alcohol	2 ounces
Ether	3 ounces

Dissolve 120 grains nitrate of silver in 3 ounces of hot alcohol, and add by constant stirring to the above collodion.

B.—Chloride of strontium	32 gr.
Citric acid	24 gr.

Reduce to a fine powder and dissolve in 4 ounces of alcohol, add

Ether	4 ounces
Gun cotton	60 gr.

The two collodions are to be mixed in equal proportions.

123. *Hern's Method.*

A.—Alcohol	7 ounces
Ether	9 ounces
Gun cotton	112 gr.
B.—Nitrate of silver	486 gr.
Distilled water	1 ounce
C.—Chloride of calcium	128 gr.
Alcohol	4 ounces
D.—Citric acid	128 gr.
Alcohol	4 ounces

Decant 8 ounces of A, add 64 drops of B in small portions, stirring up well after every addition, and 4 drachms of C in the same way. Finally 4 drachms of D must be added in the same manner as the calcium solution.

124.—Printing on Silk.

Boiling water	80 ounces
Chloride of ammonium	100 gr.
Iceland moss	60 gr.

When nearly cold, filter and immerse the silk for fifteen minutes. Sensitize for fifteen minutes in an acid 20-grain silver bath, and when dry stretch the fabric over cardboard. Print deeper than usual and tone in

Water	20 ounces
Acetate of sodium	2 drachms
Chloride of gold	3 gr.
Common whiting	a few gr.

125.—Making Silver Prints on Wood.

Gelatine	45 gr.
White soap	45 gr.
Water	5¼ fluid ounces

Soak the gelatine in water for five or six hours, then dissolve it with the aid of a water bath. Cut the soap into small pieces, and add to the gelatine solution, stirring the whole with a glass rod to insure a perfect mixture; then add powdered alum until the froth disappears, and strain through muslin. Cover the block with this mixture and a little zinc white, then wipe off so that a very thin film will be left, rubbing it gently, so that the film may be of as even a thickness as possible. After drying, apply with a badger's-hair brush a coating of the following composition:

Albumen	3¼ fluid ounces
Water	2½ fluid ounces
Chloride of ammonium	67½ gr.
Citric acid	18¾ gr.

Whip the albumen to a froth, and allow it to settle; to the limpid portion add the water, then the sal ammonia, and carefully stir with a glass rod. then add the citric acid. When the block is dry, sensitize with a solution of

Nitrate of silver	187½ gr.
Water	3¼ fluid ounces

Pour this upon the surface of the block, spread it evenly with a glass rod and pour off the excess. When the block is dry, expose it under a negative in the usual manner, until it is printed the exact shade desired. When printed, immerse the printed surface in a very strong solution of salt for about three minutes. Then wash it under a stream of water for a short time, and fix it by placing it face downward in a saturated solution of hyposulphite of soda. After fixing, wash under a stream of water for about ten minutes; when dry, it is finished, and ready for the engraver.

126.—To Transfer Photographs upon Wood for Engraving.

Float the reverse side of sensitized albumen paper for fifteen minutes upon a 4 per cent. solution of bichromate of potassium; dry well; expose to light till the picture is fairly visible; place the print upon a glass plate under water until the unacted on bichromate is dissolved out; after removal from the water, roll in with fatty ink.

When the picture is sufficiently blackened, and nearly dry, it can be transferred upon the engraver's block by rubbing it on carefully.

PRINTING WITH THE SALTS OF IRON.

127.—Cyanotypes or Blue Prints.

A.—Citrate of iron and ammonium	1⅞ ounces
Water	8 ounces
B.—Ferricyanide of potassium	1¼ ounces
Water	8 ounces

Mix equal parts immediately before use and float the paper, Rives' plain, upon it for three minutes; hang up to dry.

To Intensify Faint Blue Prints.—Soak them for five minutes in a solution of 1 drachm of ferric chloride in 32 ounces of water, and wash again.

128.—Eastman's Permanent Bromide Paper.

No. 1.

Oxalate of potash	1 pound
Hot water	48 ounces
Acetic acid	3 drachms

No. 2.

Proto-sulphate of iron	1 pound
Hot water	32 ounces
Acetic acid (or citric acid, ¼ ounce)	½ drachm

No. 3.

Bromide potassium	1 ounce
Water	1 quart

These solutions keep separately, but must be mixed only for immediate use.

To Develop.—Take in a suitable tray—

No. 1	6 ounces
No. 2	1 ounce
No. 3	½ drachm

Mix in the order given; use cold. After exposure, soak the paper in water until limp; then immerse in the developer.

The image should appear slowly, and should develop up *strong, clear and brilliant.* When the shadows are sufficiently black, pour off the developer and flood the print with the

Clearing Solution.

Acetic acid	1 drachm
Water	32 ounces

Do not wash the print after pouring off the developer and before applying the clearing solution.

Use a sufficient quantity to flow over the print, say, 2 ounces for an 8 x 10. Allow it to act for one minute, and then pour it off and apply a fresh portion; repeat the operation a third time, then rinse in pure water and immerse for ten minutes in the

Fixing Bath.

Hyposulphite of soda	3 ounces
Water	16 ounces

After fixing, wash thoroughly *two hours* and hang up to dry. Use fresh developer for each batch of prints. With a glass bottomed tray 7 ounces of developer are sufficient for a 25 x 30 print.

129.—Eastman's Enameled Bromide Paper

Is developed as above.

130.—To Tone Bromide of Silver Prints and Diapositives to a Warm Color.

A.—Uranium nitrate	1 Gm.
Water	100 Gm.
B.—Potassium ferricyanate	2 Gm.
Glacial acetic acid	8 Gm.
Water	100 Gm.

Mix immediately before use.

131.—Kallitype Printing (Formula No. 2).

Dissolve 15 Gm. of ferric oxalate in 500 C.c. of water, and 3 Gm. of silver nitrate in 500 C.c. of water. Mix the two solutions, and float the paper upon it for two minutes.

Print till the half shadows of the cliché are out, and develop in

Water	1000 Gm.
Rochelle salts	10 Gm.
Borax	7 Gm.
And of a saturated solution of potassium bichromate	from 2 to 4 drops

The picture is thoroughly developed in fifteen minutes; afterward immerse it in diluted ammonia, 1 : 100; wash and dry.

Potassium bichromate acts here as a restrainer. Too much of it makes the print harsh and chalky, and a longer exposure is required to make a good print.

132.—The Kallitype (*The Photographic Times* Formula).

Coat stout but fine grained paper with a solution of

Sodium ferric-oxalate	6 drachms
Water	2½ ounces

Dry quickly without the application of heat, and print till the deeper shadow portions of the picture become visible. On removal of the print from the frame, immerse into a 1½ per cent. solution of nitrate of silver acidified slightly with citric acid, when the picture will develop brilliantly and with all detail.

Finally wash in pure water. A yellow tinge may be washed away with a 5 per cent. solution of oxalic acid.

133.—Formula for Vici (Kallitype) Paper, Hopkins's.

Use this paper when thoroughly dry. Do not print in rainy weather expecting superior results, nor after 4 P.M. expecting black tones. This paper prints but slightly; developing is done afterward.

Print in direct sunlight until deep shadows are well indicated.

Developing may be done in weak white light.

As with Omega paper, the prints when finished will be of a darker color than they appear in the developer. There is no chance in overdeveloping, care only being required in the printing. Do not expose prints in too strong white light until after having taken out of the fixing solution.

Immerse prints one at a time in either of the following solutions,

breaking any air bubbles that may appear, until the yellow of the paper entirely disappears. This takes about five minutes.

Develop as soon as possible after removing from printing frame, as they continue to print after once exposed.

Black Tones.

Water	10 ounces
Rochelle salts	1 ounce
Borax	¾ ounce

Sepia Tones.

Water	10 ounces
Rochelle salts	1 ounce
Borax	2 drachms

Dissolve cold, shake well, leave any undissolved borax in bottle, and filter.

Restraining Solution.

Bichromate of potash	20 gr.
Water	10 ounces

15 to 20 minims must be added to 10 ounces of mixed developer.

Increasing the amount of this solution in the developer adds brilliancy to the prints, and prevents flatness. Increase it for feeble negatives, decrease it for intense; excess will totally destroy half tone. As prints are taken from the developing solution, place them in clear water. When prints are all developed, remove them from the water to the fixing bath, as follows:

Water	32 ounces
Ammonia	2 drachms

Leave the prints in this bath for ten minutes, or two baths for five minutes each for large quantities.

Wash for twenty minutes, mount and dry. Prints when finished may be toned with platinum in the following bath:

Water	20 ounces
Platinum potash chloride	15 gr.
Citric acid	5 gr.

134.—Converting Blue Prints into Brown Prints.

Blue ferro-prussiate photographic prints may be converted into brown prints by the following process:

The positive blue print, thoroughly washed and dried, is plunged into a solution of ammonia, in which it is kept until it has nearly or entirely lost its color. (The operation lasts from two to four minutes.) The print is rinsed and plunged into a bath of tannic acid, the operation being stopped as soon as the desired sharpness and tone are obtained.

This last operation requires about ten minutes. If at the end of this time the color be not dark enough, it is intensified by adding to the bath a few drops of ammonia. After a lapse of one or two minutes, rinse in abundant water.

1. Solution for preparing the sensitized paper:

Tartrate of iron and potassium	15 Gm.
Red prussiate of potash	12 Gm.
Rain water	250 C.c.

2. Solution to remove the color of the print:

Stronger ammonia (0.900)	100 C.c.
Rain water	800 C.c.

3. Solution to give the brown tone:

Tannic acid	10 Gm.
Rain water	500 C.c.

Dissolve and filter.

135.—Toning Blue Prints.

Blue prints may be given the black tone by plunging them into a solution of 4 parts of potash in 100 parts of water; then, when the blue color has entirely disappeared under the action of the potash, and a yellowish color has taken its place, they are immersed in a solution of 4 parts of tannin in 100 parts of water; then, washing them again, we obtain prints whose tone may be assimilated to that of pale writing ink.

136.—Pellett's Method for Making Blue Lines upon White Ground.

The formula is composed as follows:

Gum arabic	385	gr.
Sodium chloride	46	gr.
Tartaric acid	62	gr.
Perchloride of iron	123	gr.
Water	3½	ounces

Highly sized and smooth paper is evenly coated with this mixture, dried in the dark, and exposed under a negative.

Develop with a saturated solution of ferrocyanide of potassium. Fix in a 1 to 20 solution of hydrochloric acid.

137.—Black Lines upon White Ground.

Water	9 ounces
Gelatine	3 drachms
Solution of perchloride of iron (U. S. Ph.)	6 drachms
Tartaric acid	3 drachms
Ferric sulphate	3 drachms

Dissolve, filter and apply to the surface of stout paper (Steinbach medium roll).

After exposure to light, under a diapositive or drawing, immerse the print in

Gallic acid	6	drachms
Alcohol	6½	ounces
Water	32	ounces

when the greenish-yellow print will turn to inky black.

Finally wash in pure water.

USEFUL RECEIPTS.

138.—To Find the Focal Length of a Lens—W. H. Sherman's Rule.

Make two images of any object of convenient length, so that the *difference* between the images will be equal to some part of the object, making the position of the ground-glass on the base of the camera where each image is in focus. The distance between the two positions of the ground-glass thus found will be the same part of the focal length that the difference of the two images is of the object.

Examples: With two images of a foot-rule, let one image be 8 inches long and the other 4 inches. The difference being one-third the length of the object, the distance between the two positions of the ground glass will be one-third of the focal length of the lens.

139.—To Calculate the Focal Fraction of Stops for Lenses.

Divide the focal length obtained by the above method expressed in inches and hundredths, by the diameter of stop opening expressed in hundredths of an inch.

140.—Labarraque's Solution.

Chloride of lime	2 ounces
Carbonate of sodium, cryst.	4 ounces
Water	40 ounces

Mix the chloride of lime with 30 ounces of the water; and dissolve the carbonate of soda in the remainder. Mix, boil and filter.

141.—Eau de Javelle.

Dry chloride of lime	2 ounces
Carbonate of potash	4 ounces
Water	40 ounces

Mix the chloride of lime with half of the water; dissolve the carbonate of potash in the remainder. Mix, boil and filter.

142.—A Few Remedies Against Blistering of Albumen Paper.

Do not dry the paper by excessive heat.
Avoid acidity in solutions.
Moisten the print before washing with a sponge saturated in alcohol.
Immerse the print before fixing in a weak alum.
Add a trace of aqua ammonia to the fixing bath.
Add one-tenth part of alcohol to the ordinary toning bath.

143.—Mat Black Varnish.

A tolerably strong solution of sandarac in alcohol, mixed with fine lampblack, dries without gloss, becomes hard without being brittle, and may be applied with a fine brush upon almost any substance.

144.—Invisible Ink.

Chloride of cobalt	50 gr.
Distilled water	1 fluid ounce
Glycerine	10 minims

Dissolve the chloride of cobalt in the distilled water, and add the glycerine.

Writing executed with this ink is invisible on paper, but on warming the writing turns blue. On exposure to damp air it becomes invisible again.

145.—Solution for Making Paper Adhere to Metal.

Tragacanth	30 Gm.
Gum arabic	120 Gm.
Water	500 C.c.

146.—To Precipitate Gold from Spent Sulphocyanate Toning Baths.

Add sulphuric acid and heat, when the gold will separate.

147.—To Keep Unmounted Albumen Prints Flat.

Soak them in equal parts of alcohol, glycerine and water; dry between blotting paper under slight pressure.

148.—Magic Photographs.

Fix an albumen print in perfectly fresh hypo solution and wash well, and soak it in a solution of 1 part bichloride of mercury, ¼ of a part of chloride of ammonium in 60 parts of water, till the photograph is bleached out.

The picture will appear again when brought into contact with hypo solution, or moistened blotting paper previously prepared with the fixing soda.

149.—Solution for Mounting Prints Without Their Cockling.

Nelson's No. 1 photographic gelatine	4 ounces
Water	16 ounces
Glycerine	1 ounce
Alcohol	5 ounces

Dissolve the gelatine in the water, then add the glycerine, and lastly the alcohol.

150.—Permanent Paste.

Arrowroot	10 Gm.
Water	100 Gm.

in which 1 gramme of gelatine has been soaked, and boil. After cooling add 10 grammes of alcohol and a few drops of carbolic acid.

151.—Leather Collodion.

2 p. c. collodion	100 parts
Castor oil	4 parts

152.—Lubricator for Hot Burnishing.

Spermaceti	10 Gm.
Castile soap	10 Gm.
Alcohol	1 liter

153.—To Remove Silver Stains from the Hands.

Sulphate of sodium (Glauber's salt)	½ ounce
Chloride of lime	¼ ounce
Water	1 ounce

Mix thoroughly, and apply with an old toothbrush.

154.—To Frost a Skylight.

Very thin starch paste, to which unboiled starch has been added. Must be free from lumps, and be daubed on with a large bristle brush.

155.—To Keep the Hands Soft and White.

Apply before retiring;

Glycerine	2 ounces
Bay rum	6 ounces
Oil cajeput	1 drachm
Oil bergamot	1 drachm

Mix well.

156.—To Remove Nitric Acid Stains from Hands or Garments.

Touch the stains with solution of permanganate of potassium; wash, rinse in dilute hydrochloric acid, and wash again.

157.—To Remove Yellow Stains from Bromide Prints.

Soak for one or two hours in

Acetic acid	2 ounces
Saturated oxalate of potassium solution	4 ounces

158.—To Remove Pyro Stains from Fingers.

Wash with a 10 per cent. solution of oxalic acid, or sulphuric acid, diluted with water, 1 : 20.

159.—To Remove Yellow Stains from Pyro Developed Negatives.

Bathe them in sulphurous acid water or in a 10 per cent. solution of sulphite of soda, to which a few drops of sulphuric acid has been added.

160.—To Remove the Odor of Hydrosulphate of Ammonium from the Dark Room.

Sprinkle the floor with a solution of nitrate of lead.

161.—To Avoid Halation.

A quick drying coating, which is applied to the back of the plate, consists of collodion, with which any dark red or brown pigment is mixed. Spanish brown or rouge answers well.

162.—To Recover Silver Bromide from Waste Emulsion.

Let the emulsion be melted, and then add a small quantity of hydrochloric acid, following by boiling for two or three minutes. The silver bromide precipitates, and the destroyed gelatine is then poured off. The bromide is then placed among the other residues for reduction.

163.—Toning Bath for Gelatine Lantern Slides.

Chloride of platinum	1 gr.
Hydrochloric acid	1 minim
Water	32 ounces

164.—Compound for Blocking Out Large Portions of a Negative.

Mix asphaltum varnish with fine lamp-black, and apply with a camel's-hair brush.

Should be kept in well-stoppered bottles.

165.—Flash-Light Powder for Orthochromatic Plates.

Pure metallic magnesium powder	10 gr.
Nitrate of sodium (finely powdered)	from 50 to 70 gr.

166.—Largest and Smallest Quantities of Chemicals Admitted to the Pyro Developer.

	Largest.	Smallest.
Pyro, per ounce	10 gr.	1¼ gr.
Sulphite of sodium	80 gr.	5 gr.
Carb. of sodium	40 gr.	1 1-5 gr.
Carb. of potassium	21 2-10 gr.	5 gr.

167.—Consumption of Chemicals in Silver Printing on Albumenized Paper.

Of 100 parts of silver used in the albumen printing process will be found

In the finished print	3 per cent
In filters, blottings and cuttings	7 per cent
In the wash water before toning	50 to 55 per cent
In the fixing bath	30 to 35 per cent
In the wash water after fixing	5 per cent

90 per cent. of the silver used may be recovered.

One sheet of paper, 18 x 22, will take from the silver bath from 30 to 45 grains of nitrate of silver.

One sheet of paper, 18 x 22, requires to tone 1½ grains of gold (1 decigram).

About 80 to 90 grains of hyposulphite of sodium are necessary to fix one sheet of paper, 18 x 22.

TABLE SHOWING COMPARATIVE VALUE OF ALKALINE CARBONATES IN DEVELOPERS. By O. G. Mason.

Commercial Name.	Chemical Symbol.	Molecular Weight.	The Commercial Salt contains of the pure Salt about	100 parts of 36 per cent Acetic Acid Require for Saturation.	Solubility in Water (approximate).
Soda, Caustic	$NaHO$	40	80 to 92%	26.66 parts of 90% Soda	1 part in 2
Sodium Carbonate, Carbonate of Soda, Sal Soda, Crystals,	$Na_2CO_3.10H_2O$	286	96 to 98%	89.38 " 96% "	1 " 2
The same, anhydrous or in dry powder	Na_2CO_3	106	About 98 to 99%	89.38 of 98 to 99% dry Sal Soda.	1 " 6
Sodium Bicarbonate, Bicarbonate of Soda, "Sesqui-carbonate of Soda,"	$NaHCO_3$	84	98 to 100%	50.91 of 99% Bicarb. Soda.	1 " 12

Equal work is done by 80 parts of Caustic Soda, 286 parts of Sal Soda (crystals), 106 parts of Sal Soda (dry), 168 parts of Bicarbonate of Soda. These quantities must be increased to make up for any impurity contained in the sample being used; for this purpose the usual percentage of impurity given in the above table may be assumed for all ordinary photographical uses.

Potassa (Caustic Potash)	KHO	56	80 to 95%	37.33 parts of 90% Potassa.	1 part in 1
Potassium Carbonate, Carbonate of Potassa, Sal Tartar, Saleratus,	$K_2CO_3.1\frac{1}{2}H_2O$	165	76 to 96% Usually about 81%	51.11 parts of 81% Carb. Potassa.	1 " 1
Potassium, Carbonate, dry	K_2CO_3	140	About 95%	122.74 parts of 95% Carb. Potassa.	1 " 1
Potassium Bicarbonate, Bicarbonate of Potassa,	$KHCO_3$	100	100%	60 parts of 100% Bicarb. Potassa.	1 " 4

Equal work is done by 112 parts Caustic Potassa, 165 parts (about) ordinary Carbonate Potassa, 200 parts of Bicarbonate Potassa. These quantities must be increased in proportion to impurities, as noted in case of Soda These two alkalies are interchangeable for doing the same amount of work when *pure*, and when the one named in a given formula can not be obtained the table may assist in choosing a substitute of proper strength and solubility.

Dry or anhydrous Carbonate of Potassium is not usually found in the market.

TABLE OF THE SYMBOLS, ATOMICITY, ATOMIC AND EQUIVALENT WEIGHTS OF THE ELEMENTS.

Name.	Symbol.	Atomicity.	Atomic Weight.	Equivalent Weight.
Aluminum	Al	iii (iv)	27.5	13.7
Antimony (Stibium)	Sb	iii (v)	122 0	122.0
Arsen	As	iii (v)	75.0	75.0
Barium	Ba	ii	137.0	68.5
Beryllium (Glucinum)	Be	ii or iii	9.4	4.7
Bismuth	Bi	iii (v)	208.0	208 0
Boron	Bo	iii (v)	11.0	11.0
Bromine	Br	i (iii, v, vii)	80.0	80.0
Carbon	C	iv	12.0	6.0
Cadmium	Cd	ii	112.0	56.0
Caesium	Cs	i	133.0	133.0
Calcium	Ca	ii	40.0	20.0
Cerium	Ce	iii (iv)	138.0	46.0
Chlorine	Cl	i (iii, v, vii)	35.5	35.5
Chromium	Cr	iv (vi)	52.2	26.1
Cobalt	Co	ii (iv)	58.8	29.4
Copper	Cu	ii	63.4	31.7
Didymium	Di	iii	145.0	
Erbium	E	iii	169.0	
Fluorine	F	i	19.0	19.0
Gallium	Ga	iv	68.0	
Germanium	Ge	iv	72.2	
Glucinum	G	ii	9.4	4.7
Gold	Au	i (iii)	196.0	196.0
Hydrogen	H	i	1.0	1.0
Indium	In	iii (iv ?)	113.4	37.8
Iodine	I	i, iii, v, vii	127.0	127.0
Iridium	Ir	ii (iv, vi)	198.0	99.0
Iron	Fe	ii (iv, vi)	56.0	28.0
Lanthanium	La	iii	139.0	46.3
Lead (Plumbum)	Pb	ii (iv)	207.0	103.5
Lithium	Li	i	7.0	7.0
Magnesium	Mg	ii	24.0	12.0
Manganese	Mn	ii (iv, vi, vii)	55.0	27.5
Mercury	Hg	ii	200.0	100.0
Molybdenum	Mo	vi	96.0	46.0

TABLE OF THE SYMBOLS, ETC.—(*Continued.*)

Name.	Symbol.	Atomicity.	Atomic Weight.	Equivalent Weight.
Niobium (Columbium)	Nb	v	94.0	18.8
Nickel	Ni	ii (iv)	58.8	29.4
Nitrogen	N	iii (v)	14.0	14.0
Osmium	Os	ii (iv, vi, viii)	199.0	99.5
Oxygen	O	ii (iv ?)	16.0	8 0
Palladium	Pd	(ii, iv, vi)	106.6	53.25
Phosphorus	P	iii (v)	31.0	31.0
Platinum	Pt	ii (iv, vi)	197.4	98.7
Potassium (Kalium)	K	i	39.0	39.0
Rhodium	Rh	ii (vi)	104.4	52.2
Rubidium	Rb	i (v)	85.4	85.4
Ruthenium	Ru	ii (iv, vi, viii)	104.4	52.2
Scandium	Sc	ii (iv, vi, viii)	43.9	52.2
Selenium	Se	ii (iv, vi)	79.4	39.7
Silicon (Silicium)	Si	iv	28.0	14.0
Silver (Argentum)	Ag	i	108.0	108.0
Sodium (Natrium)	Na	i	23.0	23.0
Strontium	Sr	ii	87.5	43.7
Sulphur	S	ii (iv, vi)	32.0	16.0
Tantalum	Ta	v	182.0	36.4
Tellurium	Te	ii (iv, vi)	127.0	64.0
Thallium	Tl	i (iii)	204.0	204.0
Thorium	Th	iv	231.5	57.87
Tin (Stannum)	Sn	ii, iv	118.0	59.0
Tungsten (Wolfram)	W	iv, vi	184.0	92.0
Uranium	U	vi (iv)	240.0	60.0
Vanadium	V	iii (v)	51.2	51.2
Ytterbium	Yt	iv	172.6	17.1
Yttrium	Y	ii	61.7	30.85
Zinc	Zn	ii	65.0	32.5
Zirconium	Zr	iv	90.0	44.8

TABLE OF SYMBOLS, ATOMIC WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del., deliquescent.

Name.	Symbol.	Molecular Weight.	One Part is Soluble in Cold Water.	One Part is Soluble in Hot Water.	Alcohol.
Acid, Acetic	$C_2H_4O_2$	60	in any proportion.		
" Boric or Boracic	H_3BO_3	62	25	3	6
" Carbolic (see Phenol)	C_6H_6O	94	16.6	3	6
" Citric	$C_6H_8O_7+H_2O$	210	0.75	0.5	s.
" Digallic (see Tannin)	$C_{27}H_{22}O_{17}$	618	0.8	0.5	0.8
" Gallic	$C_7H_6O_5+H_2O$	188	100	3	8
" Hydrobromic	HBr	81	s.	s.	s.
" Hydroiodic	HI	128	s.	s.	s.
" Hydrochloric	$HCl+7H_2O$	36.5	s.	s.	s.
" Hydrofluoric	$HFl+3H_2O$	74	s.	s.	s.
" Hydrocyanic	HCy	27	s.	s.	s.
" Hydrosulphuric	H_2S	34	s.	s.	s.
" Muriatic (see Hydrochloric)	.....	.....	.....	.....	.....
" Nitric	HNO_3	63	in all proportions.		
" Nitrous	HNO_2	47	absorbed.		.....
" Oxalic	$C_2H_2O_4+2H_2O$	126	8	0.2	s. also in ether
" Pyrogallic (see Pyrogallol)	$C_6H_6O_3$	126	2	v. s.	also v. s. in ether.
" Salicylic	$C_7H_6O_3$	138	7.6	9	also v. s. in ether.
" Sulphuric	H_2SO_4	98	in all proportions.		
" Sulphurous	H_2SO_3	82	absorbed.		.....
" Tannic (see Digallic)	.....	.....	.....	.....	.....
" Tartaric	$C_4H_6O_4$	150	0.8	0.5	5
Alcohol, Ethyl	C_2H_6O	46	in all proportions.		

Alcohol, Methyl (see Wood Alcohol)	CH_4O	32	in	all proportions.	
Alum (see Potassium Aluminium Sulphate)	$Al_2(SO_4)_3K_2SO_4 24H_2O$	948	10	8	n. s.
Alum Chrome (see Potassium Chromic Sulph.)	$Cr_2(SO_4)_3K_2SO_4 24H_2O$	999	10	dec.	n. s.
Amidol (Diamido Phenol)	$C_6H_8N_2O$	124	very	soluble.	.....
Ammonia, Gaseous	NH_3	17	very	soluble.	.....
Ammonium Bichromate	$(NH_4)_2Cr_2O_7$	252	v. s.	v. s.	.....
" Bromide	NH_4Br	98	1.29	0.7	31.5
" Cadmium Bromide	$2NH_4Br2CdBr_2+H_2O$	584	0.73	.....	5.3
" " Iodide	$2NH_4ICdI_2+2H_2O$	692	0.58	.....	0.70
" Chloride	NH_4Cl	53.5	3	1	sp. s.
" Ferric Oxalate	$Fe_2(C_2O_4)_6(NH_4)_6+8H_2O$	892	2.10	0.29	sp. s.
" Fluoride	NH_4Fl	37	v. s.	v. s.	sp. s.
" Iodide	NH_4I	145	1	0.5	s.
" Nitrate	NH_4NO_3	80	2	1	s.
" Oxalate	$(NH_4)_2C_2O_4$	124	4	2	s.
" Sulphide	NH_4HS	51	v. s.	v. s.	o. s.
" Sulpho-Cyanate	NH_4CNS	76	s.	s.	s.
Aurantia (Hexanitro-diphenylamin Ammonia)	$C_{12}H_4(NO_2)_6N.NH_4$	456	.....	.....	.....
Aurin (Trioxy-triphenyl-Carbinol)	$C_{19}H_{14}O_3$	290	.....	.....	.....
Barium Chloride	$BaCl_2+2H_2O$	345	2 18	1 5	sp. s.
" Nitrate	$Ba(NO_3)$	261	12.2	2.84	n. s.
" Per-oxide	BaO_2	169	v. s.	n. s.	n. s.
Benzole or Benzine (Trioxy-triphenyl-Carbinol)	C_6H_6	78	n. s.	n. s.	s.
Borax (see Sodium Biborate)	.....	.....	.....	.....	.....
Cadmium Bromide	$CdBr_2+4H_2O$	344	1.5	1	sp. s.
" Iodide	CdI_2	366	1 5	1	s.
Calcium Bromide	$CaBr_2+4H_2O$	272	1	.75	s.
" Carbonate (see Chalk)	$CaCO_3$	100	n. s.	n. s.	n. s.
" Chloride	$CaCl_2$	111	.75	.5	10.
" Hypochlorite (see Chloride of Lime)	$CaCl_2O_2CaCl_2(?)$	254	sp. s.	sp. s.	dec.
Calomel (see Mercurous Chloride)	.....	.....	.....	.....	.....
Camphor	$C_{10}H_{16}O$	152	1000	.....	v. s.
Caustic Potash (see Potassium Hydrate)	.....	.....	.....	.....	.....
" Soda (see Sodium Hydrate)	.....	.....	.....	.....	.....
Chalk (see Calcium Carbonate)	.....	.....	.....	.....	.....

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Name.	Symbol.	Molecular Weight.	One Part is Soluble in Cold Water.	One Part is Soluble in Hot Water.	Alcohol.
Chinoline Blue or Cyanine	$C_{29}H_{35}NaI$	538	sp. s.	sp. s.	s.
" Red	$C_{26}H_{19}NaCl$	394.5			
Chloride of Lime (see Calcium Hypochlorite)					
Chlorine	Cl	35 5	absorbed by 1 to 2.5 vols.		
Chloroform	$CHCl_3$	119.5	sp. s.	sp. s.	v. s.
Chrome Alum (see Alum Chrome)					
Copper Acetate (see Verdigris)	$Cu(C_3H_3O_2)_2,H_2O$	199	14	5	1 in 14
" Bromide	$CuBr_2$	223.4	1	.75	s.
" Chloride	$CuCl_2,H_2O$	170.5	1	.75	v. s.
" Sulphate (see Blue Vitriol)	$CuSO_4,5H_2O$	249.2	3	1	n. s.
" " and Ammonia	$CuSO_4,4NH_3+H_2O$	245.5	s.	v. s.	n. s.
Corrosive Sublimate (see Mercuric Chloride)					
Dextrine	$C_6H_{10}O_5$	162	easily s.		n. s.
Eikonogen (Amido-β-Naphthol-β-Monosulphonate of Sodium)	$C_6H_{10}O_5$	261	40	e. s.	s.
Eosine, Yellow Shade (Tetra Bromo-fluoresceine Potassium)	$C_{20}H_6Br_4O_5K_2$	724	s.	s.	s.
Eosine, Red Shade (Tetra Brom.-fluores. Sod)	$C_{20}H_6Br_4O_5Na_2$	692	s.	s.	s.
Epsom Salt (see Magnesium Sulphate)					
Erythrosine M. (Tetra Iodo-fluoresceine Potassium or Sodium)	$C_{20}H_6I_4O_5K_2$ or Na_2	912 or 880	s.	s.	s.
Erythrosine G. (Di-iodo-fluoresceine Potassium or Sodium)	$C_{20}H_6I_2O_5K_2$ or Na_2	660 or 628	s.	s.	s.

Gelatine, Glutine	49,3C,6,6H18,3N25,8O	1267.2	sp. s.	e. s.	n. s.
Glycerine	$C_3H_8O_3$	92	in all proportions.		
Glycine (Oxy-phenylglycine)	$C_8H_9O_3N$	167	.....	.....	.....
Gold, Neutral Chloride	$AuCl_3$	303.5	1	5	also in ether.
" and Cadmium Chloride	$CaAuCl_5$	414.5	s.	s.	s.
" and Potassium Chloride	$KAuCl_4+5H_2O$	468	s.	s.	s.
" and Sodium Chloride	$NaAuCl_4+8NaCl+2H_2O$	892	s.	s.	s.
" Sodium Hyposulphite	$AuNa_3S_4+2H_2O$	525	s.	s.	s.
Gun Cotton (Tetra-nitrate Cellulose)	$C_{12}H_{16}O_6(NO_3)_4$	564	n. s.	n. s.	in ether
" " (Tri-nitrate Cellulose)	$C_{10}H_{17}O_7(NO_6)_3$	459	n. s.	n. s.	alcohol
Hydrochinone	$C_6H_6O_2$	110	s.	s.	also in ether.
Hydroxylamine Hydrochlorate	NH_3OHCl	69.5	0.6	e. s.	4
Iodine	I	127	sp. s.	sp. s.	e. s.
Iridium Tetra-chloride	$IrCl_4$	335	.....	.....	.....
Iron, Ammonium Sulphate	$FeSO_4(NH_4)_2SO_4+6H_2O$	392	v. s.	dec.	n. s.
" Chloride (Ferric)	Fe_2Cl_6	325	.75	.5	1 in 1
" Chloride (Ferrous)	$FeCl_2$	127	2	1	1 in 1
" Citrate	$Fe_2(C_6H_5O_7)_2$	598	s.	s.	n. s.
" Citrate and Ammonia	$(C_6H_5O_7)_2Fe_2(NH_4)_3$	355	s.	s.	sp. s.
" Iodide	FeI_2	310	v. s.	v. s.	v. s.
" Nitrate	$Fe(NO_3)_2,6H_2O$	288	v. s.	dec.	dec.
" Oxalate (Ferric)	$Fe_2(C_2O_4)_3$	376	s.	s.	n. s.
" " (Ferrous)	FeC_2O_4	144	in potassium oxal.		n. s.
" Sulphate (Ferric)	$Fe_2(SO_4)_3$	400	s.	dec.	s.
" " (Ferrous)	$FeSO_4,7H_2O$	278	1.5	1	n. s.
Kaoline	$H_2Al_2Si_2O_8+H_2O$	258.8	not soluble.		.....
Lead, Acetate (see Sugar of Lead)	$Pb(C_2H_3O_2)_2,3H_2O$	378	2.5	2	1 in 12.5
" Carbonate	$PbCO_4$	366	n. s.	sp. s.	n. s.
" Iodide	PbI_2	460	s.	s.	n. s.
" Nitrate	$Pb(NO_3)_2$	330	7.7	7	s.
" Oxide	PbO	222.4	n. s.	n. s.	Alkalis.
Lithium, Bromide	LiBr	87	.66	.5	v. s.
" Chloride	$LiCl+H_2O$	60.5	1.3	1	s.
" Iodide	LiI	134	.61	.5	s.
Magnesium, Bromide	$MgBr_2$	184	1	.75	s.

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Name.	Symbol.	Molecular Weight.	One Part is Soluble in Cold Water.	One Part is Soluble in Hot Water.	Alcohol.
Magnesuim, Chloride	$MgCl_2$	95	2	1.5	s.
" Iodide	MgI_2	246.3	1	.75	v. s.
" Sulphate (see Epsom Salt)	$MgSO_4,7H_2O$	246	1.3	1	sp. s.
Manganous Chloride	$MnCl_2+4H_2O$	198	s.	s.	n. s.
Mercury, Chloride (Mercuric) (see Corros. Subl.)	$HgCl_2$	271	19	3	5
" " (Mercurous) (see Calomel)	Hg_2Cl	235.5	n. s.	n. s.	n. s.
" Cyanide	$HgCy_2$	252	8	2	1 in 20
" Iodide (Mercuric)	HgI_2	454	sp. s.	sp. s.	sp. s.
" " (Mercurous)	Hg_2I	654	n. s.	n. s.	n. s.
Metol (Mono-methyl Para-amidometakresol)	$C_8H_{11}NO$	137	s.	s.	s.
Para-amidophenol	C_6H_7NO	109	sp. s.	s.	.....
Para-amidophenol Sodium	C_6H_6NaNO	131	easily	soluble.	.....
Para-amidophenol Hydrochlorate	C_6H_7NOHCl	145.5	s.	s.	s.
Para-rosaniline (Triamido-phenyl-Carbinol)	$C_{19}H_{19}N_3O$	305	.....	.....	.....
Phenol (see Carbolic Acid)	.....	.....	.....	.....	.....
Platino-potassium Chloride or Chloro-platinite of Potassium	K_2PtCl_4	417.4	6.	.....	s.
Platino sodium Chloride or Chloro-platinite of Sodium	Na_2PtCl_4	385.4	solu	ble.	.....
Platinum Chloride.	$PtCl_4+5H_2O$	429.4	.....	*	.....
Potassa (see Potassium Hydrate).	.....	.....	.....	.....	.....

* Real platinum-chloride is but little soluble in water; the article of commerce of that name answers to the formula $PtCl_4 2HCl+6H_2O$, and is of the atomic weight 520.4 (K. Schwier). It is easily soluble in water, probably in the proportion of 1:6.

Potassium, Aluminium Sulphate (see Alum)	$Al_2(SO_4)_3,K_2SO_4.24H_2O$	948	10	8	n. s.
" Bicarbonate	$KHCO_3$	100	3	2	n. s.
" Bichromate	$K_2Cr_2O_7$	295	10	7	n. s.
" Bromide	KBr	119	2	1	1 in 90
" Carbonate	$KO_2C_3+2H_2O$	174	.75	.5	n. s.
" Chlorate	$KClO_3$	122.5	16	2	n. s
" Chloride	KCl	74.5	3	2	sp s.
" Chromic Sulph. (see Chrome Alum)	$Cr_2(SO_4)_3,K_2SO_4,24H_2O$	999	10	dec.	n. s.
" Citrate	$K_3C_6H_5O_7H_2O$	324 3	6.6	.3	n. s.
" Cyanide	KCy	65.1	1	.5	sp. s.
" Ferric Sulphate	$K_2SO_4.Fe_2(SO_4)_3,24H_2O$	100.6	s.	s.	n. s.
" Ferri-cyanide (see Red Prussiate)	$K_6Fe_2Cy_{12}$	658.6	2.5	1.2	n. s.
" Ferro-cyanide (see Yellow Pruss.)	K_4FeCy_6	368.4	3	1	n. s.
" Fluoride	$KFl+2H_2O$	94	v. s.	v. s.	v. s.
" Hydrate	KOH	56	.5	.25	sp. s.
" Iodide	KI	166	.75	.5	1 in 16
" Nitrate (see Saltpetre)	KNO_3	101	4	1	n. s.
" Oxalate	$KC_2O_4H_2O$	235	3	2	sp. s.
" Permanganate	$KMnO_4$	158	16	10	n. s.
" Sulpho-cyanate	$KCyS$	97	2	1	sp. s.
Pyrogallo. (see Pyrogallic Acid)	.....	.....	.....	.....	.....
Rhodan (German appellation for Cyanates)	.....	.....	.....	.....	.....
Rodinal (ready-prepared Para-amido Developer)	.....	.....	.....	.....	.....
Silver, Acetate	$AgC_2H_3O^2$	167	sp. s.	sp. s.	n. s.
" Bromide	$AgBr$	188	n. s.	n. s.	in HCl and HBr.
" Carbonate	Ag_2CO_3	276	n. s.	n. s.	n. s.
" Chloride	$AgCl$	143.5	n. s.	n. s.	Ammonia, cyan. potass. hyposulphite of soda.
" Citrate	$Ag_3C_6H_5O_7$	513	sp. s.	sp. s.	.....
" Fluoride	$AgFl$	127	v. s.	v. s.	v. s.
" Iodide	AgI	235	n. s.	n. s.	same as Chloride.
" Nitrate	$AgNO_3$	170	1	.5	sp. s.

TABLE OF SYMBOLS, ATOMIC WEIGHT AND SOLUBILITIES OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY.

Abbreviations.—s., soluble; v. s., very soluble; sp. s., sparingly soluble; n. s., not soluble; dec., decomposed; del , deliquescent.

Name.	Symbol.	Molecular Weight.	One Part is Soluble in Cold Water.	One Part is Soluble in Hot Water.	Alcohol.
Silver, Nitrite	$AgNO_2$	154	300	dec.	n. s.
" Oxalate	$Ag_2C_2O_4$	304	sp. s.	s.	n. s.
" Oxide	Ag_2O	232	n. s.	n. s.	n. s.
" Sulphide	Ag_2S	248	n. s.	n. s.	n. s.
Soda, Caustic (see Sodium Hydrate)					
Sodium Acetate	$NaC_2H_3O_2,6H_2O$	190	3	.66	n. s.
" Biborate (Borax)	$Na_2B_4O_7,10H_2O$	382	12.5	2	n. s.
" Bromide	$NaBr$	103	1.25	1	1:16
" Bicarbonate	$NaHCO_3$	84	12	dec.	n. s.
" Carbonate	$Na_2CO_3,10H_2O$	286	2	1	n. s.
" Chloride	$NaCl$	58.5	2.75	2.75	n. s.
" Citrate	$Na_3C_6H_5O_7$	258	1	.5	sp. s
" Hydrate	$NaHO$	40	1.5	·5	sp. s.
" Hypo-sulphite	$Na_2S_2O_3 5H_2O$	248	1.5	1	sp. s.
" Iodide	NaI	150	5	.3	sp. s.
" Nitrate	$NaNO_3$	85	1.36	1	1 in 37
" Sulph-antimoniate or Schlippe's Salt	$NaSbS_3$	241	s.	s.	n. s.
" Sulphate	$Na_2SO_4,10H_2O$	322	2	4	s.
" Sulphide	$Na_2S,9H_2O$	240	s.	s.	sp. s.
" Sulphite	$Na_2SO_3,7H_2O$	252	4	2	sp. s.
" Tungstate	$Na_2WO_4+2H_2O$	326	s.	s.	n. s.
" Thio-sulphate (see Hypo-sulphite)					
Strontium, Bromide	$SrBr_2,6H_2O$	355.5	1	.75	sp. s.
" Chloride	$SrCl_2,6H_2O$	266.5	1.8	1	sp. s.

Strontium, Nitrate	$Sr(NO_3)_2$	211.5	5	2	sp. s.
Sugar of Lead (see Lead Acetate)					
Tannin (see Digallic Acid)					
Thymol	$C_6H_3(CH_3(C_3H_7)COO$	177	sp.		and in ether.
Tin, Chloride (Stannic)	$SnCl_4$	260	dec.	in much	water.
" Chloride (Stannous)	$SnCl_2,2H_2O$	225	135:100	655:100	v. s.
Uranium, Bromide	$UBr_2,4H_2O$	352	1	.5	sp. s.
" Nitrate	$UO_2(NO_3)_2.6H_2O$	384	.5	.25	v. s.
" Sulphate	$UO_2(SO_4),3H_2O$	302	.5	.25	v. s.
Verdigris (see Copper Acetate)					
Vitriol, Blue (see Copper Sulphate)					
" Green (see Iron Sulphate)					
" White (see Zinc Sulphate)					
Water	H_2O	18			
Washing Soda (see Sodium Carbonate)					
Wood Alcohol (see Alcohol Methyl)					
Zinc, Bromide	$ZnBr_2$	225	del.	and c. s.	s.
" Chloride	$ZnCl_2$	136	.33		s.
" Iodide	ZnI_2	319	.33	dec.	v. s.
" Nitrate	$Zn(NO_3)_2,6H_2O$	296	del.	del.	del.
" Sulphate (see White Vitriol)	$ZnSO_4.7H_2O$	287	2.	1.	n. s.
Zircon Earth	Z_1O_2	121.6	n. s.	n. s.	n. s.

IMPURITIES IN PHOTOGRAPHIC CHEMICALS AND TESTS FOR THEM.

Substance.	Impurities Possibly Present.	Tests.
Ammonia	Carbonic Acid.	Renders lime-water milky.
	Dissolved solid matter	Residue left on evaporation.
	Chlorides.	After acidulating with nitric acid, it gives a precipitate with silver nitrate, which, after washing, is readily soluble in ammonia, and re-precipitated by nitric acid.
	Sulphates.	After acidulating with nitric acid, it gives a precipitate with barium nitrate.
	Lime.	A white precipitate with oxalate of ammonium.
	Lead is often present, derived from the action upon flint glass bottles.	Black precipitate with sulphuretted hydrogen.
Nitric Acid	Traces of sulphuric acid.	After dilution it gives a precipitate with barium nitrate.
	Chlorides.	After dilution it gives a precipitate with silver nitrate.
	Peroxide of nitrogen.	The acid is yellow.
	Iodine may be present if the acid be prepared from sodium nitrate.	After dilution and cooling it gives a blue color with starch paste or mucilage.
Hydrochloric Acid	Free chlorine.	Liberates iodine from solution of potassium iodide. See also chlorides, nitric acid.
	Sulphuric acid.	As above for nitric acid.
	Perchloride of iron.	Yellow color. Brown precipitate with ammonia added till it smells slightly.
Hydrochloric Acid	Arsenic.	Marsh's test.
	Some yellow samples contain no iron, but an organic salt, and give an alkaline ash on ignition of the residue after evaporation.	Reinsh's test; a small piece of copper foil becomes coated on boiling in dilute acid.
Sulphuric Acid	Bisulphate of potassium.	Residue on evaporation.
	Sulphate of lead.	Milkiness on dilution. May be completely freed from lead by diluting with three or four times as much water, and allowing to settle.
	When sold as pure, it invariably contains a trace of iron. Common acid is also liable to contain arsenic, selenium, thallium, and many other substances.	No easy test can be given, as the substances are so numerous; some of them volatile, and most require separation from the acid before detection.
	Organic matter, as a piece of straw in a carboy of acid.	Gives a brown color to the acid.
Acetic Acid	Water.	Does not solidify when cooled to 17° C, (53° F.)
	Sulphurous and hydrochloric acids.	White precipitate with silver nitrate.
	Aldehyde, or volatile tarry matter.	Blackens in the light after adding silver nitrate.
	Organic sulphuric acid.	Smell of garlic.
Citric Acid	Tartaric acid.	Strong solution of potassium acetate added to a strong solution of the acid will deposit white crystalline bitartrate.
Pyrogallic Acid	Metagallic acid.	Black residue insoluble in water.
Silver Nitrate	Free nitric acid.	Reddens litmus paper (neutral silver nitrate does not affect litmus).
Potassium Carbonate	Chlorides and sulphates.	Same as for ammonia.
Potassium Iodide	Potassium carbonate.	A strong solution is alkaline to test paper.
	Sulphates and chlorides.	Same as for ammonia.
	Potassium iodate.	A pretty strong solution becomes yellow from liberation of iodine on addition of dilute sulphuric acid, or better, a strong solution of citric acid.

IMPURITIES IN PHOTOGRAPHIC CHEMICALS AND TESTS FOR THEM.—*Continued.*

Substance.	Impurities Possibly Present.	Test.
Potassium Bromide	Similar to potassium iodide.	See potassium iodide.
Sodium Carbonate	Chlorides and sulphates.	Same as for ammonia.
Sodium Chloride	Chloride of calcium.	Oxalate of ammonium (after addition of a little acetic acid) gives a milkiness or precipitate, indicating calcium; filter this out, and add ammonia, chloride of ammonium, and phosphate of sodium (clear solutions). A precipitate indicates magnesium. Both the above cause dampness in wet weather.
	Chloride of magnesium.	
	Sodium sulphate.	As for sulphates in ammonia.
Potassium Cyanide	Potassium carbonate nearly always present.	Effervescence with dilute acids, giving off a gas carbonic anhydride, which renders lime water turbid.
Potassium Hydrate		Effervescence with dilute acids.
Kaolin	Chalk.	Same as for ammonia.
Water	Sulphates and chlorides.	Deposited by boiling.
	Calcium carbonate, temporary hardness.	Test as for calcium chloride, see sodium chloride.
	Ammonia, almost always present in distilled and rain water.	Brown coloration, or precipitate with Nessler's re-agent.
Gelatine	Alum.	Ash, sometimes as much as 10 per cent.
	Fatty matter.	Separated by precipitation with alcohol. Dissolved out by ether or benzine, and left as a residue on evaporation of the solvent.
Ammonium Bromide	Potassium bromide, or other non-volatile bodies.	Leaves a residue when heated.
	Ammonium chloride.	Same as for chlorides in ammonia.
Pyrogallic Acid	Powdered glass.	Left behind on solution.
Potassium Iodide	Potassium bromide.	The crystals of bromide are usually more transparent than those of iodide, but no reliance can be placed on this.
Silver Nitrate	Potassium nitrate, sometimes present in the fused sticks, not in the crystals.	Will not yield the full quantity of chloride on precipitation with HCl. Gives a purple color to flame.
Calcium Chloride	Calcium hydrate.	The clear filtered solution made with distilled water is alkaline to test paper, and gives a precipitate on breathing into it through a tube.
Pure Chemicals generally.	Broken glass, bits of straw, wood, paper, &c.	These impurities either float or sink on the solution, and may easily be seen.

COMPARISON OF EIKONOGEN DEVELOPERS FOR RAPID EXPOSURES.

REDUCED TO ONE OUNCE OF PREPARED DEVELOPER.

By C. W. GRANT.

No.	Water.	Eiko.	Sulph. Sodium.	Carb. Pot.	Remarks.
	1 oz.	Grs.	Grs.	Grs.	
1	480 m.	7.3	43.7	10.9	*American Amateur Photographer*, Aug. 1890, p. 303.
2	"	8.3	22	11	By Seed Dry Plate Co. *
3	"	5.5	11	11	" Cramer Dry Plate Co. *
4	"	16	64	16	" Harvard " " *
5	"	16	32	16	" Gottheil. AM. ANN., 1890, p. 269.‡‡
6	"	6	30	12A	" W. H. Rau.† AM. ANN., 1890, p. 225.
7	"	12	32	12	" Allen & Rowell.††
8	"	6	24	16	" Eagle D. P. Works.
9	"	6	12	9B	" U. S. Supply Co.
10	"	12	24	8	" John Nicol.** AM. ANN., 1890, p. 41.
11	"	6	28	9C	" F. C. Beach.‡
12	"	5	30	5	" *Photo. Times.****
					" Chautauqua School.
Totals.	5760	106.1	352.7	135.9	Divide by 12—Equals Average.
No. 1	480 m.	8.8	29.4	11.3	Average.
No. 2	480 m.	9.5	29.4	12.2	Average, Nos. 1 to 10 inclusive.
.....	480 m.	12	32	12	Recommended.

Allen & Rowell furnished the following formula for use with their slide plates, and can attest its efficiency, and I use it exclusively for slides and bromide prints, but substitute carb. pot. for c. soda.

Water to make	1 ounce
Sulph. Soda (cryst.)	18 grains
Eiko	3 grains
Quinol	3 grains
Carb. Soda	18 grains
Carb. Lithium	3 grains

* These were taken from an article by Mr. F. C. Beach.

‡‡ Herr Gottheil gives Carb. Pot. (as above) for rapid exposures.

† Mr. Rau considers Eiko. with Carb. *Soda*, inferior to Pyro.

‡ Mr. Beach considers Carb. Pot. more powerful than Carb. Soda, and less liable to cause stains. Confirmed by Gottheil, Rau, Nos. 1, 2, 3, 4, 5, 7, 8, 10, 12, and by compiler.

††—A. Given as 24 grs. Carb. Soda.

***—C. Given as 17 grs. Carb. Soda. Not stated if for rapid exposures.

**—B. Given as 9 grs. Carb. Soda.

TABLE OF EXPOSURES.

By H. L. Ide.

Intended for use with Carbutt's Special Sensitometer 25 Plates. The table being prepared from the diagram of comparative exposures published on page 308 of '92 Times Annual and intended to be used in connection with this diagram for ascertaining the exposure in other months of the year.

Hours. Morning.	5					6					7					8					9					10					11					12					Noon.	Month, July.
Hours. Evening.	7					6					5					4					3					2					1					12					Afternoon.	
Near view, with foliage or dark objects or shadows in foreground Portraits and living objects out of doors.	1	1/5	3/8	1/2	3/4	1	1/20	1/10	1/8	1/5	1/4	1/40	1/20	1/16	1/10	1/8	1/64	1/32	1/20	1/16	1/10	1/72	1/36	1/24	1/18	1/12	1/80	1/40	1/32	1/20	1/16	2	Near view, light colored buildings or bright objects in foreground. Near view, with long distance street scenes.
	2	3/8	3/4	1	1½	2	1/10	1/5	1/4	3/8	1/2	1/20	1/10	1/8	1/5	1/4	1/32	1/16	1/10	1/8	1/5	1/36	1/18	1/12	1/9	1/6	1/40	1/20	1/16	1/10	1/8	4	
	4	3/4	1½	2	3	4	1/5	3/8	1/2	3/4	1	1/10	1/5	1/4	3/8	1/2	1/16	1/8	1/5	1/4	3/8	1/18	1/9	1/6	2/9	1/3	1/20	1/10	1/8	1/5	1/4	8	
	8	1½	3	4	6	8	3/8	3/4	1	1½	2	1/5	3/8	1/2	3/4	1	1/8	1/4	3/8	1/2	3/4	1/9	2/9	1/3	4/9	2/3	1/10	1/5	1/4	3/8	1/2	16	
	16	3	6	8	12	16	3/4	1½	2	3	4	2/5	3/4	1	1½	2	1/4	1/2	3/4	1	1½	2/9	4/9	2/3	7/8	1⅓	1/5	3/8	1/2	3/4	1	32	
	32	6	12	16	24	32	1½	3	4	6	8	3/4	1½	2	3	4	1/2	1	1½	2	3	4/9	7/8	1⅓	1¾	2⅔	3/8	3/4	1	1½	2	64	
	64	12	24	32	48	64	3	6	8	12	16	1½	3	4	6	8	1	2	3	4	6	7/8	1¾	2⅔	3½	4¾	3/4	1½	2	3	4	128	
	128	24	48	64	96	128	6	12	16	24	32	3	6	8	12	16	2	4	6	8	12	1¾	3½	4¾	7	9½	1½	3	4	6	8	256	
Distant view, no near foreground.	2	1/10	1/5	1/4	3/8	1/2	1/40	1/20	1/16	1/10	1/8	1/80	1/40	1/32	1/20	1/16	1/128	1/72	1/40	1/32	1/20	1/144	1/72	1/48	1/36	1/24	1/160	1/80	1/64	1/40	1/32	8	Sea and sky.
	4	1/5	3/8	1/2	3/4	1	1/20	1/10	1/8	1/5	1/4	1/40	1/20	1/16	1/10	1/8	1/64	1/32	1/20	1/16	1/10	1/72	1/36	1/24	1/18	1/12	1/80	1/40	1/32	1/20	1/16	16	
	8	3/8	3/4	1	1½	2	1/10	1/5	1/4	3/8	1/2	1/20	1/10	1/8	1/5	1/4	1/32	1/16	1/10	1/8	1/5	1/36	1/18	1/12	1/9	1/6	1/40	1/20	1/16	1/10	1/8	32	
	16	3/4	1½	2	3	4	1/5	3/8	1/2	3/4	1	1/10	1/5	1/4	3/8	1/2	1/16	1/8	1/5	1/4	3/8	1/18	1/9	1/6	2/9	1/3	1/20	1/10	1/8	1/5	1/4	64	
	32	1½	3	4	6	8	3/8	3/4	1	1½	2	1/5	3/8	1/2	3/4	1	1/8	1/4	3/8	1/2	3/4	1/9	2/9	1/3	4/9	2/3	1/10	1/5	1/4	3/8	1/2	128	
	64	3	6	8	12	16	3/4	1½	2	3	4	3/8	3/4	1	1½	2	1/4	1/2	3/4	1	1½	2/9	4/9	2/3	7/8	1⅓	1/5	3/8	1/2	3/4	1	256	
	128	6	12	16	24	32	1½	3	4	6	8	3/4	1½	2	3	4	1/2	1	1½	2	3	4/9	7/8	1⅓	1¾	2⅔	3/8	3/4	1/2	1½	2		
Remarks.	U. S. Stop Number.	Sunshine.	Sun obscured.	Cloudy.	Very dull.	Gloomy.	Sunshine.	Sun obscured.	Cloudy.	Very dull.	Gloomy.	Sunshine.	Sun obscured.	Cloudy.	Very dull.	Gloomy.	Sunshine.	Sun obscured.	Cloudy.	Very dull.	Gloomy.	Sunshine.	Sun obscured.	Cloudy.	Very dull.	Gloomy.	Sunshine.	Sun obscured.	Cloudy.	Very dull.	Gloomy.	U. S. Stop Number.	Remarks.

TABLE INDICATING THE DISTANCE AT WHICH THE DEPTH OF FOCUS BECOMES INFINITE.

Focal Distance in Centimetres.	Relation of Lighting.											
	$\frac{f}{5}$	$\frac{f}{10}$	$\frac{f}{15}$	$\frac{f}{20}$	$\frac{f}{25}$	$\frac{f}{30}$	$\frac{f}{35}$	$\frac{f}{40}$	$\frac{f}{45}$	$\frac{f}{50}$	$\frac{f}{55}$	$\frac{f}{60}$
5.....	2.5	1.3	0 9	0.7	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3
10.....	10.0	5.0	3.4	2.5	2.0	1.7	1.5	1.3	1.2	1.0	0.9	0.9
15.....	22.5	11.3	7.5	5.7	4.5	3.8	3.3	2.9	2.5	2.3	2.1	1.9
20.....	40.0	20.0	13.4	10.0	8.0	6.7	5.8	5.0	4.5	4.0	3.7	3.4
25.....	62.5	31.3	20.9	15.7	12.5	10.5	9.0	7.9	7.0	6.3	5.7	5.3
30.....	90.0	45.0	30.0	22.5	18.0	15.0	12.9	11.3	10.0	9.0	8.2	7.5
35	122 5	61.3	40.9	30.7	22.5	20.5	17.5	15.4	13.6	12.3	11.2	10.3
40.....	160.0	80.0	53.4	40.0	32.0	26.7	22.9	20.0	17.8	16.0	14.6	13.4
45.....	202.5	101.3	67.5	50.7	40.5	33.8	29.0	25.4	22.5	20.3	18.4	16 9
50.....	250	125.0	83.4	62.5	50.0	41.7	35.8	31.3	27.8	25.0	22.8	20.9

To find the distance of the nearest object beyond which everything is in focus with a lens of 0^m 15 of focus; with a diaphragm of which the relation of lighting is $f/20$ we search in the horizontal line this relation and looking in this column we find opposite the figure 15, indicating the focal distance, the figure 5.7 or 5^m 70 for the distance from which all the points situated further on will give a sharp image on the ground-glass.

If the focal distance is not found in the table, or if the relation of lighting is not given exactly as on the diaphragm, one can use the following formula which gives the same result:

$$P^p = \frac{F^2}{n \times 2.}$$

That is to say, to know the depth posterior to p^p of the focus, raise to the square the focal length F, and divide the square by the denominator of the fraction indicating the diaphragm n multiplied by 2; for example, for the case above cited:

$$\frac{15^2}{20 \times 2} = \frac{225}{40} = 5.60, \text{ hence } 5^m60.$$

One sees that this second method gives very nearly the same result, and a result accurate enough in practice.

TABLE OF EQUIVALENT QUANTITIES OF SOME HALOIDS USED IN PHOTOGRAPHY.

CALCULATED FOR THE ANHYDROUS AND DRY SALTS.

By A. B. AUBERT, Professor of Chemistry, Maine State College, Orono, Me.

†EQUIVALENT QUANTITIES OF VARIOUS CHLORIDES USED IN PHOTOGRAPHY.

Sodium Chloride.	Potassium Chloride.	Ammonium Chloride.	Lithium Chloride.	Cadmium Chloride.
1	1.275	0.914	0.726	1.564
0.784	1	0.717	0.569	1 226
1.093	1.394	1	0.794	1.710
1.376	1.755	1.258	1	2.152
0.639	0.818	0.584	0.464	1

†EQUIVALENT QUANTITIES OF VARIOUS BROMIDES USED IN PHOTOGRAPHY.

Bromine.	Ammonium Bromide.	Potassium Bromide.	Sodium Bromide.	Cadmium Bromide + 4 Equi. Water.	Zinc Bromide.
1	1.225	1.488	1.287	2.150	1.406
0.816	1	1.214	1.055	1.754	1.147
0.672	0.823	1	0.865	1.445	0.945
0.777	0.952	1.156	1	1.671	1.092
0.465	0.570	0.692	0.599	1	0.654
0.711	0.871	1 058	0.915	1.529	1

†EQUIVALENT QUANTITIES OF VARIOUS IODIDES USED IN PHOTOGRAPHY.

Iodine.	Ammonium Iodide.	Potassium Iodide.	Sodium Iodide.	Cadmium Iodide.	Zinc Iodide.
1	1.142	1.307	1.181	1.441	1.255
0.876	1	1.145	1.035	1.262	1.099
0.765	0.874	1	0.903	1.102	0.960
0.847	0.967	1.107	1	1.220	1.063
0.694	0.793	0.907	0.820	1	0.871
0.797	0.910	1.042	0.941	1.148	1

†EQUIVALENT QUANTITIES OF VARIOUS SILVER SALTS USED IN PHOTOGRAPHY.

Silver (Metallic).	Nitrate.	Chloride.	Bromide.	Iodide.
1	1.574	1.328	1.741	2.176
0.6353	1	0.844	1.106	1.382
0.7523	1.184	1	1.310	1.638
0.5744	0.904	0.763	1	1.250
0.4595	0.723	0.610	0.800	1

†EQUIVALENT QUANTITES OF VARIOUS GOLD SALTS USED IN PHOTOGRAPHY.

Gold (Metallic).	Chloride.	Double Chloride of Gold and Potassium.	Double Chloride of Gold and Sodium.
1	1.542	2.1048	2.0229
0.6485	1	1.3645	1.3119
0.4751	0.7326	1	0.9611
0.4943	0.7623	1.0405	1

† Translated and partly recalculated from the "Agenda du Chimiste."

ACKLAND'S TABLES FOR THE SIMPLIFICATION OF EMULSION CALCULATIONS.

No. 1.

	Equivalent weights.	Weight of $AgNO_3$ required to convert one grain of soluble haloid.	Weight of soluble haloid required to convert one grain $AgNO_3$	Weight of silver haloid produced by one grain of soluble haloid.	Weight of soluble haloid required to produce one grain of silver haloid.	Weight of silver haloid produced from one grain $AgNO_3$.
Ammonium bromide.....	98	1.734	.576	1.918	.521	
Potassium "	119.1	1.427	.700	1.578	.633	
Sodium "	103	1.650	.606	1.825	.548	1.106
Cadmium " com...	172	.988	1.012	1.093	.915	
" " anh....	136	1.25	.800	1.382	.723	
Zinc "	112.1	1.509	.663	1.670	.600	
Ammonium chloride.....	53.5	3.177	.315	2.682	.373	.844
Sodium "	58.5	2.906	.344	2.453	.408	
Ammonium iodide.....	145	1.172	.853	1.620	.617	
Potassium "	166.1	1.023	.977	1.415	.707	1.382
Sodium "	150	1.133	.882	1.566	.638	
Cadmium "	183	.929	1.076	1.284	.778	

Table No. 1 presents the actual weights of haloid or silver, as the case may be, required to convert or combine with one grain of another.

In order to make (say) ten ounces of emulsion by a new formula, which, for the sake of showing the working of the table, we will write down as follows:

Bromide of potassium..... .....150 grains.
Iodide of potassium..... 10 "
Chloride of ammonium..... 10 "
Gelatine.....200 "

we want to know how much silver nitrate should be employed in sensitizing this mixture. For this purpose we use the first column, in which we find against each haloid the exact quantity of silver nitrate required to fully decompose one grain. Taking, then, the figures we find in column No. 1 against the three salts in the above formula, and multiplying them by the number of grains of each used, we have the following sum:

Potassium bromide.....150 × 1.427 = 214 } Weight
" iodide..... 10 × 1.023 = 10.23 } silver nitrate
Chloride of ammonium..... ..... 10 × 3.177 = 31.77 } required.

or the total quantity of silver nitrate required for full conversion, 256.00 grains.

ELSDEN'S TABLE OF POISONS AND ANTIDOTES.

	Poisons.	Remarks.	Characteristic Symptoms.	Antidote.
Caustic Vegetable Acids.	Oxalic Acid. including Potassium Oxalate.	1 dram is the smallest fatal dose known.	Hot, burning sensation in throat and stomach; vomiting, cramps, and numbness.	Chalk, whiting or magnesia, suspended in water. Plaster or mortar can be used in emergency.
Caustic Alkalies.	Ammonia. Potash. Soda.	Vapor of ammonia may cause inflammation of the lungs.	Swelling of tongue, mouth, and fauces; often followed by stricture of the œsophagus.	Vinegar and water.
Metallic Salts.	Mercuric Chloride.	3 grains the smallest known fatal dose.	Acrid, metallic taste, constriction and burning in throat and stomach, followed by nausea and vomiting.	White and yolk of raw eggs with milk. In emergency, flour paste may be used.
	Acetate of Lead.	The sub-acetate is still more poisonous.	Constriction in the throat and at pit of stomach; crampy pains and stiffness of abdomen; blue line round the gums.	Sulphates of soda or magnesia. Emetic of sulphate of zinc.
	Cyanide of Potassium.	*a.* Taken internally, 3 grs. fatal.	Insensibility, slow, gasping respiration, dilated pupils, and spasmodic closure of the jaws.	No certain remedy; cold affusion over the head and neck most efficacious.
		b. Applied to wounds and abrasures of the skin.	Smarting sensation.	Sulphate of iron should be applied immediately.
	Bichromate of Potassium	*a.* Taken internally. *b.* Applied to slight abrasions of the skin.	Irritant pain in stomach, and vomiting. Produces troublesome sores and ulcers.	Emetics and magnesia, or chalk.
	Nitrate of Silver.		Powerful irritant.	Common salt to be given immediately, followed by emetics.
Concentrated Mineral Acids.	Nitric Acid.	2 drams have been fatal. Inhalation of the fumes has also been fatal.	Corrosion of windpipe and violent inflammation.	Bicarbonate of soda, or carbonate of magnesia or chalk, plaster of the apartment beaten up in water.
	Hydrochloric Acid.	½ ounce has caused death.		
	Sulphuric Acid.	1 dram has been fatal.		
	Acetic Acid, concentrated, has as powerful an effect as the mineral acids.			
	Iodine.	Variable in its action; 3 grains have been fatal.	Acrid taste, tightness about the throat, vomiting.	Vomiting should be encouraged, and gruel, arrowroot and starch given freely.
	Ether.	When inhaled.	Effects similar to chloroform.	Cold affusion and artificial respiration.
	Pyrogallol.	2 grains sufficient to kill a dog.	Resemble phosphorus poisoning.	No certain remedy. Speedy emetic desirable.

UNITED STATES WEIGHTS AND MEASURES.

ACCORDING TO EXISTING STANDARDS.

LINEAL.

	Inches.	Feet.	Yards.	Rods.	Fur's.	Mile.
12 inches = 1 foot.	12 =	1				
3 feet = 1 yard.	36 =	3 =	1			
5.5 yards = 1 rod.	198 =	16.5 =	5.5 =	1		
40 rods = 1 furlong.	7,920 =	660 =	220 =	40 =	1	
8 furlongs = 1 mile.	63,360 =	5,280 =	1,760 =	320 =	8 =	1

SURFACE—LAND.

	Feet.	Yards.	Rods.	Roods.	Acres.
144 sq. ins. = 1 sq. ft.	9 =	1			
9 sq. ft. = 1 sq. yard.	272.25 =	30.25 =	1		
30.25 sq. yds. = 1 sq. rod.	10,890 =	1,210 =	40 =	1	
40 sq. rods = 1 sq. rood.	43,560 =	4,840 =	160 =	4 =	1
4 sq. roods = 1 acre.	27,878,400 =	3,097,600 =	102,400 =	2,560 =	640
640 acres = 1 sq. mile.					

VOLUME—LIQUID.

	Gills.	Pints.	Gallon.	Cub. In.
4 gills = 1 pint.	32 =	8 =	1 =	231
2 pints = 1 quart.				
4 quarts = 1 gallon.				

FLUID.

Gallon.	Pints.	Ounces.	Drachms.	Minims.	Cubic Centimetres.
1 =	8 =	128 =	1,024 =	61,440 =	3,785,435
	1 =	16 =	128 =	7,680 =	473,179
		1 =	8 =	480 =	29,574
			1 =	60 =	3,697

16 ounces, or a pint, is sometimes called a fluid pound.

TROY WEIGHT.

Pound.	Ounces.	Pennyweights.	Grains.	Grams.
1 =	12 =	240 =	5,760 =	373.24
	1 =	20 =	480 =	31.10
		1 =	24 =	1.56

APOTHECARIES' WEIGHT.

lb.	℥	ʒ	℈	gr.	
Pound.	Ounces.	Drachms.	Scruples.	Grains.	Grams.
1 =	12 =	96 =	288 =	5,760 =	373.24
	1 =	8 =	24 =	480 =	31.10
		1 =	3 =	60 =	3.89
			1 =	20 =	1.30
				1 =	.06

The pound, ounce, and grain are the same as in Troy weight.

AVOIRDUPOIS WEIGHT.

Pound.	Ounces.	Drachms.	Grains (Troy).	Grams.
1 =	16 =	256 =	7,000 =	453.60
	1 =	16 =	437.5 =	28.35
		1 =	27.34 =	1.77

ENGLISH WEIGHTS AND MEASURES.

APOTHECARIES' WEIGHT.

20 Grains	= 1 Scruple	=	20 Grains.
3 Scruples	= 1 Drachm	=	60 Grains.
8 Drachms	= 1 Ounce	=	480 Grains.
12 Ounces	= 1 Pound	=	5760 Grains.

FLUID MEASURE.

60 Minims	= 1 Fluid Drachm
8 Drachms	= 1 Fluid Ounce.
20 Ounces	= 1 Pint.
8 Pints	= 1 Gallon.

The above weights are usually adopted in formulas.

All Chemicals are usually sold by

AVOIRDUPOIS WEIGHT.

$27\frac{11}{32}$ Grains	= 1 Drachm	=	$27\frac{11}{32}$ Grains.
16 Drachms	= 1 Ounce	=	$437\frac{1}{2}$ Grains.
16 Ounces	= 1 Pound	=	7000 Grains.

Precious Metals are usually sold by

TROY WEIGHT.

24 Grains	= 1 Pennyweight	=	24 Grains.
20 Pennyweights	= 1 Ounce	=	480 Grains.
12 Ounces	= 1 Pound	=	5760 Grains.

NOTE.—An ounce of metallic silver contains 480 grains, but an ounce of nitrate of silver contains only $437\frac{1}{2}$ grains.

UNITED STATES FLUID MEASURE.

Gal.		Pints.		Ounces.		Drachms.		Mins.		Cub. In.		Grains.		Cub. C.M.
1	=	8	=	128	=	1,024	=	61,440	=	231.	=	58,328.886	=	3,785.44
		1	=	16	=	128	=	7,680	=	28.875	=	7,291.1107	=	473.18
				1	=	8	=	480	=	1.8047	=	455.6944	=	29.57
						1	=	60	=	0.2256	=	56.9618	=	3.70

IMPERIAL BRITISH FLUID MEASURE.

Gal.		Pints.		Ounces.		Drachms.		Mins.		Cub. In.		Grains.		Cub. C.M.
1	=	8	=	160	=	1,280	=	76,800	=	277.27384	=	70,000	=	4,543.732
		1	=	20	=	160	=	9,600	=	34.65923	=	8,750	=	567.966
				1	=	8	=	480	=	1.73296	=	437.5	=	28.398
						1	=	60	=	0.21662	=	54.69	=	3.550

METRIC SYSTEM OF WEIGHTS AND MEASURES.

MEASURES OF LENGTH.

Denominations and Values.		Equivalents in Use.
Myriameter	10,000 meters.	6.2137 miles.
Kilometer	1,000 meters.	.62137 mile, or 3,280 ft. 10 ins.
Hectometer	100 meters.	328. feet and 1 inch.
Dekameter	10 meters.	393.7 inches.
Meter	1 meter.	39.37 inches.
Decimeter	1-10th of a meter.	3.937 inches.
Centimeter	1-100th of a meter.	.3937 inch.
Millimeter	1-1000th of a meter.	.0394 inch.

MEASURES OF SURFACE.

Denominations and Values.		Equivalents in Use.
Hectare	10,000 square meters.	2.471 acres.
Are	100 square meters.	119.6 square yards.
Centare	1 square meter.	1,550. square inches.

MEASURES OF VOLUME.

Denominations and Values.			Equivalents in Use.	
Names.	No. of Liters.	Cubic Measures.	Dry Measure.	Wine Measure.
Kiloliter or stere	1,000	1 cubic meter.	1.308 cubic yards.	264.17 gallons.
Hectoliter	100	1-10th cubic meter.	2 bu. and 3.35 pecks.	26.417 gallons.
Dekaliter	10	10 cubic decimeters.	9.08 quarts.	2.6417 gallons.
Liter	1	1 cubic decimeter.	.908 quart.	1.0567 quarts.
Deciliter	1-10	1-10th cubic deimeter.	6.1023 cubic inches.	.845 gill.
Centiliter	1-100	10 cubic centimeters.	.6102 cubic inch.	.338 fluid oz.
Milliliter	1-1000	1 cubic centimeter.	.061 cubic inch.	.27 fl. drm.

WEIGHTS.

Denominations and Values.			Equivalents in Use.
Names.	Number of Grams.	Weight of Volume of Water at its Maximum Density.	Avoirdupois Weight.
Millier or Tonneau	1,000,000	1 cubic meter.	2204.6 pounds.
Quintal	100,000	1 hectoliter.	220.46 pounds.
Myriagram	10,000	10 liters.	22.046 pounds.
Kilogram or Kilo	1,000	1 liter.	2.2046 pounds.
Hectogram	100	1 deciliter.	3.5274 ounces.
Dekagram	10	10 cubic centimeters.	.3527 ounce.
Gram	1	1 cubic eentimeter.	15.432 grains.
Decigram	1-10	1-10th of a cubic centimeter.	1.5432 grain.
Centigram	1-100	10 cubic millimeters.	.1543 grain.
Milligram	1-1000	1 cubic millimeter.	.0154 grain.

For measuring surfaces, the square dekameter is used under the term of ARE; the hectare, or 100 ares, is equal to about 2½ acres. *The unit of capacity* is the cubic decimeter or LITER, and the series of measures is formed in the same way as in the case of the table of lengths. The cubic meter is the unit of measure for solid bodies, and is termed STERE. *The unit of weight* is the GRAM, which is the weight of one cubic centimeter of pure water weighed in a vacuum at the temperature of 4 deg. Cent. or 39.2 deg. Fahr., which is about its temperature of maximum density. In practice, the term cubic centimeter, abbreviated c.c, is generally used instead of milliliter, and cubic meter instead of kiloliter.

METRIC SYSTEM OF WEIGHTS AND MEASURES.

THE meter is a measure of length equal to 39.370 English or American inches, a standard of linear measure supposed to be the ten-millionth part of the distance from the equator to the north pole, as ascertained by actual measurement of an arc of the meridian.

This system, formed on the meter as the unit of length, has four other leading units, all connected with and dependent upon this. Hence, we have:

1. The meter, which is the unit of measures of length.

2. The are, which is the unit of surface, and is the square of the meter.

3. The liter, which is the unit of measures of capacity, and is the cube of a tenth part of the meter.

4. The stere, which is the unit of measures of solidity, having the capacity of a cubic meter.

5. The gram, which is the unit of measures of weight, and is the weight of that quantity of distilled water at its maximum density, fills the cube of a hundredth part of the meter.

Each unit has its decimal multiples and sub-multiples, that is weights and measures ten times larger, or ten times smaller, than the principal units. The prefixes denoting multiples are derived from the Greek, and are: Deka, ten; hecto, hundred; kilo, thousand; and myria, ten thousand. Those denoting sub-multiples are taken from the Latin, and are: Deci, ten; centi, hundred (as in centigram or centimeter); and milli, thousand.

The metric system has been adopted by many nations, the English excepted. In America its use has been made optional, but is legalized by Congress. All photographic formulas received from the continent of Europe express values and quantities with metrical weights and measures. To utilize them directly without translating into the expressions of the English system, the student is advised to procure gram weights and cubic centimeter graduates, and substitute them for those denoting quantities according to the old plan.

As an assistance to those who cannot acquire these aids, we annex tables, which convert grams and cubic centimeters into English grains, drachms, and ounces sufficiently correct for practical purposes.

METRIC FLUID MEASURES.

The cubic centimeter, usually represented by "C.c.," is the unit of the metric measurement for liquids. It contains 17 minims of water. The weight of this quantity of water is 1 gram. The following table will prove to be sufficiently accurate for photographic purposes:

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH MEASURE.

1 cubic centimeter	=	17 minims.							
1 cubic centimeters	=	34	"						
3 "	=	51	"						
4 "	=	68	"	or	1 dram		8 minims.		
5 "	=	85	"	"	1	"	25	"	
6 "	=	101	"	"	1	"	41	"	
7 "	=	118	"	"	1	"	58	"	
8 "	=	135	"	"	2 drams		15	"	
9 "	=	152	"	"	2	"	32	"	
10 "	=	169	"	"	2	"	49	"	
20 "	=	338	"	"	5	"	38	"	
30 "	=	507	"	"	1 ounce		0 dram	27 minims	
40 "	=	676	"	"	1	"	3 drams	16	"
50 "	=	845	"	"	1	"	6 "	5	"
60 "	=	1014	"	"	2 ounces		0 "	54	"
70 "	=	1183	"	"	2	"	3 "	43	"
80 "	=	1352	"	"	2	"	6 "	32	"
90 "	=	1521	"	"	3	"	1 "	21	"
100 "	=	1690	"	"	3	"	4 "	10	"
1000 "	=	1 liter = 34 fluid ounces nearly, or 2⅛ pints.							

THE CONVERSION OF FRENCH (METRIC) INTO ENGLISH WEIGHT.

The following table, which contains no error greater than one-tenth of a grain, will suffice for most practical purposes:

1 gram	=	$15\frac{2}{5}$ grains.							
2 grams	=	$30\frac{4}{5}$	"						
3 "	=	$46\frac{1}{5}$	"						
4 "	=	$61\frac{4}{5}$	"	.....	or	1 dram		$1\frac{4}{5}$ grain.	
5 "	=	$77\frac{1}{5}$	"	.....	"	1	"	$17\frac{1}{5}$ grains.	
6 "	=	$92\frac{3}{5}$	"	.....	"	1	"	$32\frac{3}{5}$	"
7 "	=	108	"	.....	"	1	"	48	"
8 "	=	$123\frac{2}{5}$	"	.....	"	2 drams		$3\frac{2}{5}$	"
9 "	=	$138\frac{4}{5}$	"	.....	"	2	"	$18\frac{4}{5}$	"
10 "	=	$154\frac{2}{5}$	"	.....	"	2	"	$34\frac{2}{5}$	"
11 "	=	$169\frac{4}{5}$	"	.....	"	2	"	$49\frac{4}{5}$	"
12 "	=	$185\frac{1}{5}$	"	.....	"	3	"	$5\frac{1}{5}$	"
13 "	=	$200\frac{3}{5}$	"	.....	"	3	"	$20\frac{3}{5}$	"
14 "	=	216	"	.....	"	3	"	36	"
15 "	=	$231\frac{2}{5}$	"	.....	"	3	"	$51\frac{2}{5}$	"
16 "	=	247	"	.....	"	4	"	7	"
17 "	=	$262\frac{2}{5}$	"	.....	"	4	"	$22\frac{2}{5}$	"
18 "	=	$277\frac{4}{5}$	"	.....	"	4	"	$37\frac{4}{5}$	"
19 "	=	$293\frac{1}{5}$	"	.....	"	4	"	$53\frac{1}{5}$	"
20 "	=	$308\frac{3}{5}$	"	.....	"	5	"	$8\frac{3}{5}$	"
30 "	=	463	"	.....	"	7	"	43	"
40 "	=	$617\frac{1}{5}$	"	.....	"	10	"	$17\frac{1}{5}$	"
50 "	=	$771\frac{3}{5}$	"	.....	"	12	"	$51\frac{3}{5}$	"
60 "	=	926	"	.....	"	15	"	26	"
70 "	=	$1080\frac{1}{5}$	"	.....	"	18	"	$0\frac{1}{5}$	"
80 "	=	$1234\frac{3}{5}$	"	.....	"	20	"	$34\frac{3}{5}$	"
90 "	=	1389	"	.....	"	23	"	9	"
100 "	=	$1543\frac{1}{5}$	"	.....	"	25	"	$43\frac{1}{5}$	"
1000 "	=	1 kilogram = 32 oz., 1 dr., $12\frac{2}{5}$ gr.							

THE CONVERSION OF METRIC INTO AMERICAN MEASURE.

By Nelson B. Sizer, B.Sc., M.D.

[From *The Photographic Times*, August 14, 1891.]

The following table is computed true to the nearest half grain or minim, as the case may be, so it will prove a sufficiently near approximation to the required metric equivalents.

U. S. P. Standard.

Gram, or c.cm.	Grains.	Minims.	Gram, or c.cm.	Grains.	Minims.
1	15½	16¼	15	231½	244
2	31	32½	16	247	260
3	46	49	17	262	276
4	62	65	18	278	292½
5	77	81	19	293	309
6	93	97½	20	308½	325
7	108	114	30	463	487½
8	123½	130	40	617	650
9	139	146	50	771½	813
10	154	162½	60	926	975½
11	170	179	70	1,080	1,138
12	185	194	80	1,234½	1,300½
13	201	211	90	1,389	1,463
14	216	227½	100	1,543	1,625½
..	....	....	1,000	15,432⅓	16,256⅓
..	....	....	....	1 kilo.	liter.

The "kilo" or kilogram, the 1,000 gram weight, is equal to 32 ounces $72\frac{2}{10}$ grains "Troy or Apothecaries" weight, or 2 pounds 3 ounces $119\frac{7}{10}$ grains Avoirdupois.

The "liter" or 1,000 cubic centimeters, or bulk of water that weighs 1 kilo, is equal to 2 pints 1 fluid ounce and $415\frac{3}{10}$ minims, U. S. P. Standard, or our glass graduates as commonly sold by reliable houses.

The grains and minims are easily reduced to fluid drachms and fluid ounces, or drachms and ounces Troy, by my readers, if they will only remember that 60 grains or minims go to the solid or fluid drachm, and 480 grains or minims, or 8 drachms solid or fluid, go to each U. S. P. ounce, solid or fluid.

Thus the table gives the value of 90 grams as 1,389 grains, of 90 cubic centimeters as 1,463 minims. How many ounces in each?

Dividing 1,389 by 60 for drachms, we have 23 drachms 9 grains. As 8 drachms go to the ounce, there are 2 ounces in the 23 drachms and 7 drachms over, so we have—in 1,389 grains there are 2 ounces 7 drachms 9 grains. In the same way we find 3 fluid ounces and 23 minims over, to be the value of 90 cubic centimeters or 1,463 minims.

TABLE SHOWING THE COMPARISON OF THE READINGS OF THERMOMETERS.

CELSIUS, OR CENTIGRADE (C). RÉAUMUR (R). FAHRENHEIT (F).

C.	R.	F.	C.	R.	F.
—30	—24.0	—22.0	23	18.4	73.4
—25	—20.0	—13.0	24	19.2	75.2
—20	—16.0	— 4.0	25	20.0	77.0
—15	—12.0	+ 5 0	26	20.8	78.8
—10	— 8.0	14.0	27	21.6	80.6
— 5	— 4.0	23.0	28	22.4	82 4
— 4	— 3.2	24.8	29	23.2	84.2
— 3	— 2.4	26.6	30	24.0	86.0
— 2	— 1.6	28.4	31	24.8	87.8
— 1	— 0.8	30.2	32	25.6	89.6
			33	26.4	91.4
Freezing point of water.			34	27.2	93.2
			35	28.0	95.0
0	0.0	32.0	36	28.8	96.8
1	0.8	33.8	37	29.6	98.6
2	1.6	35.6	38	30.4	100.4
3	2.4	37.4	39	31.2	102.2
4	3.2	39.2	40	32.0	104.0
5	4.0	41.0	41	32.8	105.8
6	4.8	42.8	42	33.6	107.6
7	5.6	44.6	43	34.4	109.4
8	6.4	46.4	44	35.2	111.2
9	7.2	48.2	45	36.0	113.0
10	8.0	50.0	50	40.0	122.0
11	8.8	51.8	55	44.0	131.0
12	9.6	53.6	60	48.0	140.0
13	10.4	55.4	65	52.0	149.0
14	11.2	57.2	70	56.0	158.0
15	12.0	59.0	75	60.0	167.0
16	12.8	60.8	80	64.0	176.0
17	13.6	62.6	85	68.0	185.0
18	14.4	64.4	90	72.0	194.0
19	15.2	66.2	95	76.0	203.0
20	16.0	68.0	100	80.0	212.0
21	16.8	69.8			
22	17.6	71.6	Boiling point of water.		

Readings on one scale can be changed into another by the following formulæ, in which t° indicates degrees of temperature:

Réau. to Fahr.

$$\frac{9}{4} t^\circ \text{ R} + 32^\circ = t^\circ \text{ F}$$

Cent. to Fahr.

$$\frac{9}{5} t^\circ \text{ C} + 32^\circ = t^\circ \text{ F}$$

Fahr. to Cent.

$$\frac{5}{9} \left(t^\circ \text{ F} - 32^\circ \right) = t^\circ \text{ C}$$

Réau. to Cent.

$$\frac{5}{4} t^\circ \text{ R} = t^\circ \text{ C}$$

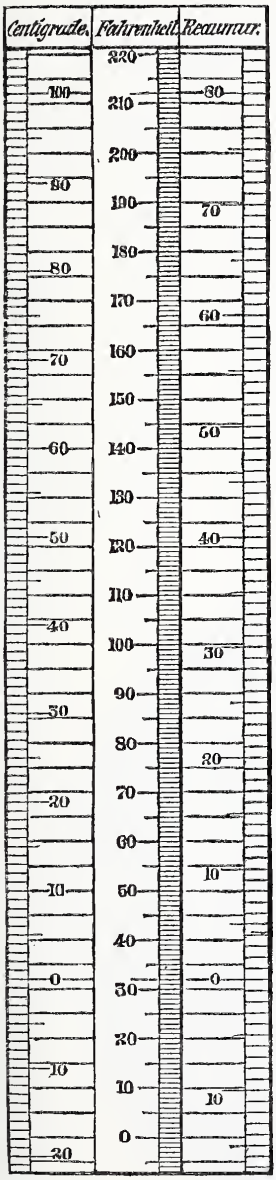
Cent. to Réau.

$$\frac{4}{5} t^\circ \text{ C} = t^\circ \text{ R}$$

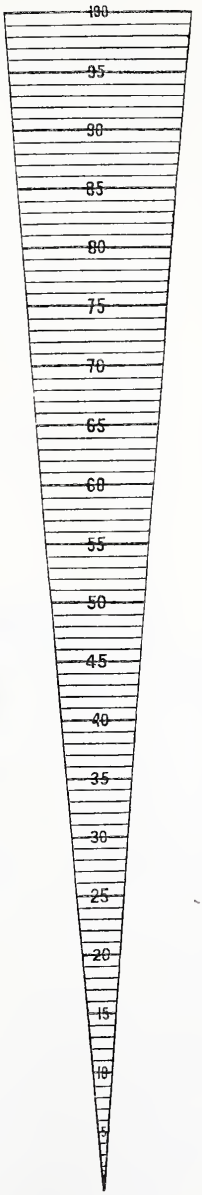
Fahr. to Réau.

$$\frac{4}{9} \left(t^\circ \text{ F} - 32 \right) = t^\circ \text{ R}$$

THERMOMETER SCALES.



SCALE FOR MEASURING DIAMETERS OF STOPS FOR LENSES.



Each cross line varies in length from the adjacent one by $\frac{1}{100}$th of an inch.

To use: Lay the stop flat on this scale, and select the cross line which is of the same length as the greatest diameter of the opening; read this off, by means of the figures, which will be the measurements in $\frac{1}{100}$ths of an inch. The equivalent focal length of lens, divided by this measurement of the stop opening, will give the fraction expressing the ratio of aperture to focal length. The rapidity of different lenses, or of the same lens with different stops, is proportional to the squares of these ratios.

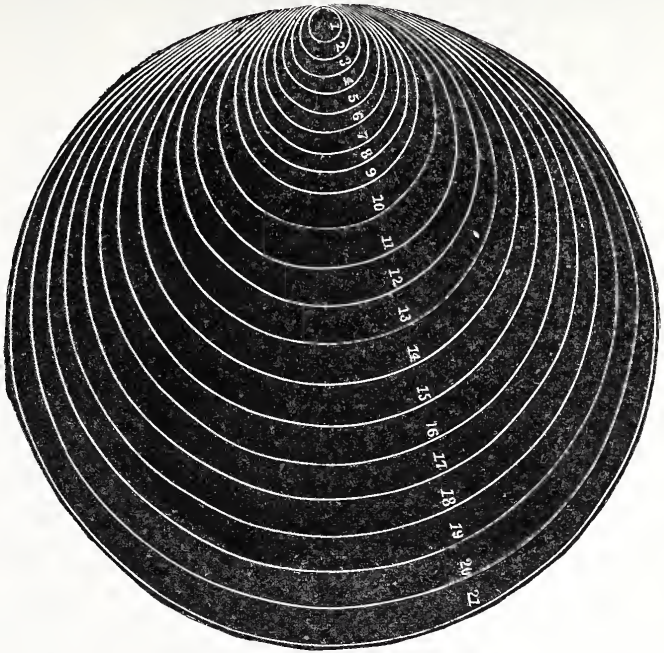
"UNIFORM SYSTEM" NUMBERS FOR STOPS FROM $\frac{f}{1}$ TO $\frac{f}{100}$.

In the following table Mr. S. A. Warburton has calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the "uniform system" of the Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No.	*f*	U. S. No.	*f*	U. S. No.
1	$\frac{1}{16}$	15	14.06	58	210.25
1¼	.097	16	16	59	217.56
1.414	⅛	17	18.06	60	225.00
1½	.140	18	20.25	61	232.56
1¾	.191	19	22.56	62	240.25
2	¼	20	25.00	63	248.06
2¼	.316	21	27.56	64	256
2½	.390	22	30.25	65	264.06
2.828	½	22.62	32	66	272.25
2¾	.472	23	33.06	67	280.56
3	.562	24	36.00	68	289.00
3¼	.660	25	39.06	69	297.56
3½	.765	26	42.25	70	306 25
3¾	.878	27	45.56	71	315.06
4	1.00	28	49.00	72	324.00
4¼	1.12	29	52.56	73	333.06
4½	1.26	30	56.25	74	342.25
4¾	1.41	31	60.06	75	351.56
5	1.56	32	64	76	361.00
5¼	1.72	33	68.06	77	370.56
5½	1.89	34	72.25	78	380.25
5.656	2	35	76.56	79	390.06
5¾	2.06	36	81.00	80	400.00
6	2.25	37	85.56	81	410.06
6¼	2.44	38	90.25	82	420.25
6½	2.64	39	95.06	83	430.56
6¾	2.84	40	100.00	84	440.00
7	3.06	41	105.06	85	451.56
7¼	3.28	42	110.25	86	462.25
7½	3.51	43	115.56	87	473.06
7¾	3.75	44	121.00	88	484.00
8	4	45	126.56	89	495.06
8¼	4.25	45.25	128	90	506.25
8½	4.51	46	132.25	90.50	512
8¾	4.78	47	138.06	91	517.56
9	5.06	48	144.00	92	529.00
9¼	5.34	49	150.06	93	540.56
9½	5.64	50	156.25	94	552.25
9¾	5.94	51	162.56	95	564.06
10	6.25	52	169.00	96	576.00
11	7.56	53	175.56	97	588.06
11.31	8	54	182.25	98	600.25
12	9.00	55	189.06	99	612.56
13	10.56	56	196.00	100	625.00
14	12.25	57	203.06		

THE PHOTOGRAPHIC SOCIETY'S (OF GREAT BRITAIN) STANDARD DIAPHRAGMS.

The annexed diagram and table are intended to facilitate the calculation of the proper number with which to mark the diaphragms according to the Photographic Society of Great Britain's Uniform System, which will be found described on another page. This number it is proposed to call the "U. S." (or uniform system number). The numbered circles in the diagram represent the sizes of stops. The photographer, knowing the equivalent focus of his lens, looks along the line opposite the number which represents the circle nearest inside to his diaphragm, and when he gets to the column headed by that equivalent focus the number there found is the U. S. number to be marked on the diaphragm. For example: A lens of eight inches equivalent focus has a diaphragm in size about No. 5 on the diaphragm; running the eye along the line opposite No. 5 we find in the column under—"focus eight inches" the No. 11, which is the U. S. number required.



No. of Circle.	4 focus	5 focus	6 focus	7 focus	8 focus	9 focus	10 focus	12 focus	14 focus
1	25	39	56						
2	11	17	25	34	44	56	68		
3	$6\frac{1}{4}$	10	14	19	25	31	40	56	
4	4	$6\frac{1}{4}$	9	12	16	20	25	36	48
5	$2\frac{3}{4}$	$4\frac{1}{4}$	$6\frac{1}{4}$	$8\frac{1}{2}$	11	14	17	25	34
6	2	$3\frac{1}{5}$	$4\frac{1}{2}$	$6\frac{1}{4}$	8	10	13	18	25
7	$1\frac{1}{2}$	$2\frac{1}{3}$	$3\frac{1}{2}$	$4\frac{3}{4}$	6	8	10	14	19
8	$1\frac{1}{4}$	2	$2\frac{3}{4}$	$3\frac{3}{4}$	5	$6\frac{1}{4}$	8	11	15
9	1	$1\frac{1}{2}$	$2\frac{1}{4}$	3	4	5	$6\frac{1}{4}$	9	$12\frac{1}{4}$
10		1	$1\frac{1}{2}$	$2\frac{1}{8}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$4\frac{1}{3}$	6	$8\frac{1}{2}$
11			$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	$3\frac{1}{5}$	5	6
12			$\frac{7}{8}$	$1\frac{1}{6}$	$1\frac{1}{4}$	2	$2\frac{1}{4}$	$3\frac{1}{3}$	$4\frac{3}{4}$
13				1	$1\frac{1}{4}$	$1\frac{5}{6}$	$1\frac{3}{8}$	$2\frac{3}{4}$	4
14					1	$1\frac{1}{4}$	$1\frac{1}{2}$	$2\frac{1}{4}$	3
15						1	$1\frac{1}{3}$	$1\frac{7}{8}$	$2\frac{1}{7}$
16							1	$1\frac{1}{2}$	2
17								$1\frac{1}{3}$	$7\frac{3}{8}$
18								$1\frac{1}{6}$	$1\frac{1}{2}$
19								1	$1\frac{1}{8}$
20									$1\frac{1}{5}$
21									1

Note.—This table, taken from the "British Journal Photographic Almanac," has proved to be very convenient in the calculating of stop values.

EQUATIONS RELATING TO FOCI.

The following simple optical formulas and calculations, worked out by Mr. J. A. C. Branfill, for the *British Journal Almanac*, will prove useful in many branches of photography, especially where several lenses of varying foci are in constant use for a variety of purposes:

p = Principal focus.
F = Greater conjugate focus.
f = Lesser conjugate focus.
r = Ratio of any dimension in original to the same dimensions in copy (in case of reduction), or *vice versa* (in case of enlargement).
a = Diameter of aperture to lens.
x = Exposure required, assuming that $x = 1$ when $a = \frac{p}{4}$.

$$p = \frac{r(F+f)}{(r+1)^2}$$

$$f = p\left(\frac{1+r}{r}\right) = \frac{F+f}{r+1}$$

$$F = p(r+1) = rf$$

$$F+f = p \times \frac{(r+1)^2}{r} = p\left(2 + r + \frac{1}{r}\right)$$

$$r = \frac{F-p}{p} = \frac{p}{f-p} = \frac{F}{f}$$

$$x = \frac{f^2}{16\,a^2}$$

N. B.—For ordinary landscape work, where r is greater than 20, x may be taken as $\frac{p^2}{16\,a^2}$

Note.—In case the above may not be clear to some photographers, the following rules may be better understood:

To find the principal focus of a lens (p), focus a near object in the camera, and measure the distance between it and the ground glass ($F+f$); next find the proportion which any dimension in the object bears to the same dimension on the ground glass (r). Thus, if the original dimension be four times as large as its reproduction, we say that r equals (=) 4. Multiply $F+f$ by r, and divide the product by the square of a number greater by one than r, that is by $(r+1)^2$. This rule was lately published by Mr. Debenham.

To find the lesser conjugate focus (f) (if p and r are known), multiply p by the sum of $r+1$ and divide the product by r. Or divide $F+f$ by $r+1$.

To find the greater conjugate focus (F) multiply p by $r+1$. Or multiply f by r.

To find $F+f$ (the distance which the ground glass should be from the object to be copied in order to get a given value for r) multiply p by the sum of $r + \frac{1}{r} + 2$.

To find r divide $F-p$ (the difference between F and p) by p. Or divide p by $f-p$. Or divide F by f.

To find x divide the square of f by 16 times the square of a (the diameter of aperture to lens).

For example Focus an object which is five inches high, so that it is one inch high on the ground glass; thus we know that $r = 5$. Next measure the distance between the object and the ground glass ($F+f$), which is found to be 45 inches.

Then $p = 45 \times$ (multiplied by) $5 \div$ (divided by) $6 \times 6 = 6\frac{1}{4}$ inches.
$f = 6\frac{1}{4} \times 6 \div 5 = 7\frac{1}{2}$ inches. Or $f = 45 \div 6 = 7\frac{1}{2}$ inches.
$F = 6\frac{1}{4} \times 6 = 37\frac{1}{2}$ inches. Or $F = 7\frac{1}{2} \times 5 = 37\frac{1}{2}$ inches.
$F+f = 6\frac{1}{4} \times (5 + \frac{1}{5} + 2) = 6\frac{1}{4} \times 7\frac{1}{5} = 45$ inches.
$r = (37\frac{1}{2} - 6\frac{1}{4}) \div 6\frac{1}{4} = 5$. Or $r = 6\frac{1}{4} \div (7\frac{1}{2} - 6\frac{1}{4}) = 5$.

And x (the exposure required) will be $7\frac{1}{2} \times 7\frac{1}{2} \div (16 \times \frac{9}{16}) = 6\frac{1}{4}$; that is, the exposure will be $6\frac{1}{4}$ times as much as the exposure required with an aperture whose diameter equals $p \div 4$, assuming the aperture (a) to be $\frac{1}{2}$ inch diameter.

FOCUSING SCALES FOR ANY LENS OF FROM 3 TO 12 INCHES EQUIVALENT FOCUS.

Drawn by W. T. Wintringham.

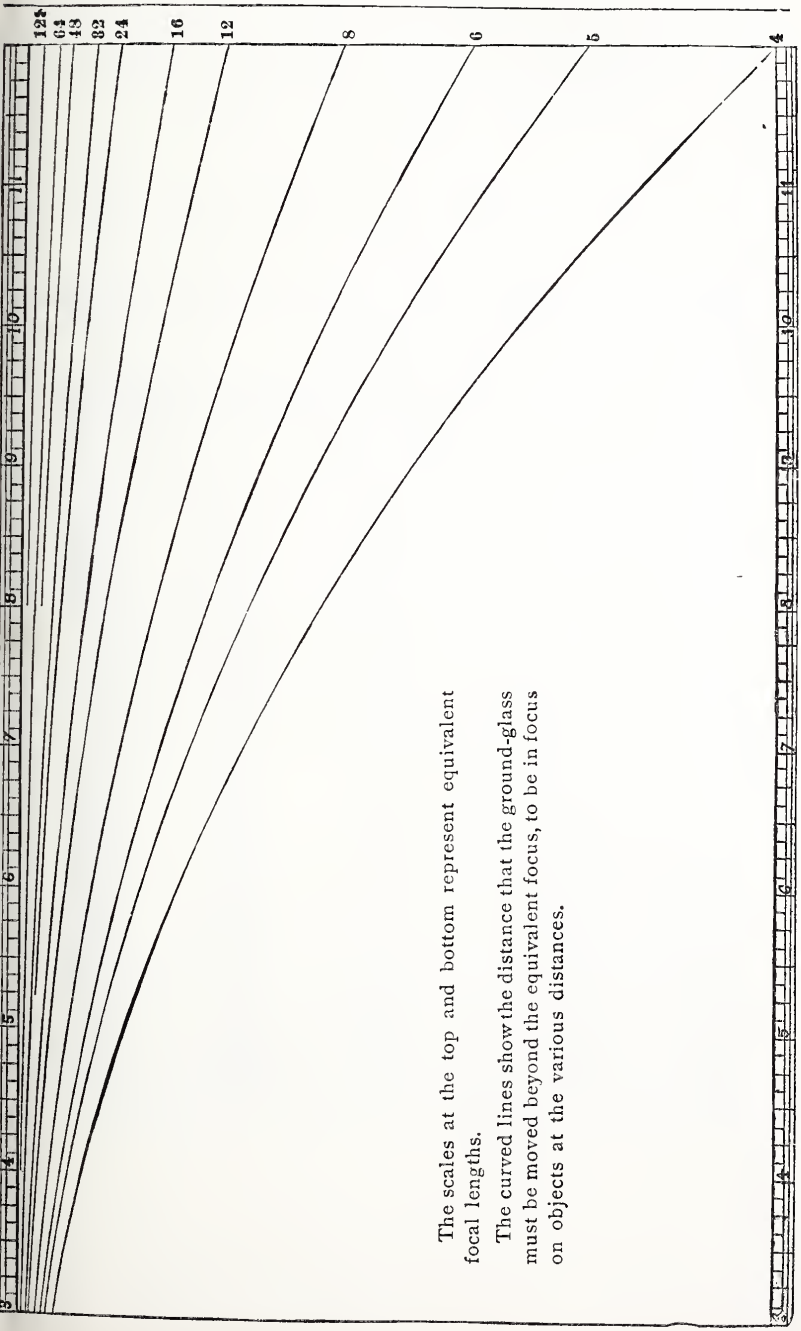


TABLE SHOWING DISPLACEMENT ON GROUND GLASS OF OBJECTS IN MOTION.

By HENRY L. TOLMAN.

[Republished, with corrections, from the *Photographic Times.*]

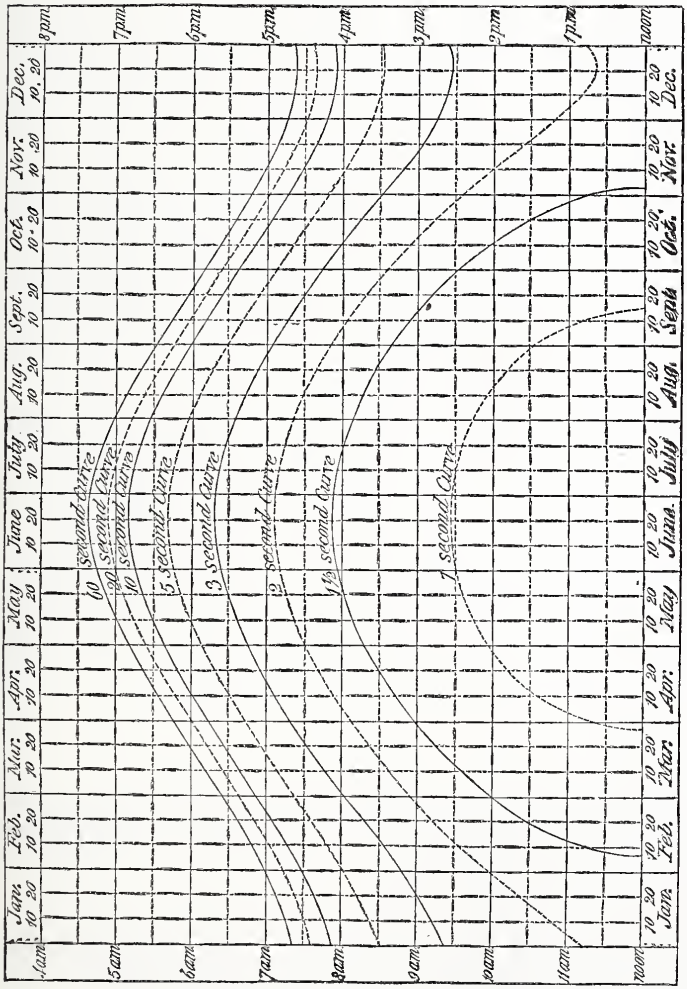
Lens 6 in Equiv. Focus, Ground Glass at Principal Focus of Lens.

Miles per Hour.	Feet per Second.	Distance on Ground Glass, in inches, with Object 30 Feet away.	Same with Object 60 Feet away.	Same with Object 120 Feet away.
1	1½	.29	.15	.073
2	3	.59	.29	.147
3	4½	.88	.44	.220
4	6	1.17	.59	.293
5	7½	1.47	.73	.367
6	9	1.76	.88	.440
7	10½	2.05	1 03	.513
8	12	2 35	1.17	.587
9	13	2.64	1.32	.660
10	14½	2.93	1.47	.733
11	16	3.23	1.61	.807
12	17½	3.52	1.76	.880
13	19	3.81	1.91	.953
14	20½	4.11	2.05	1.027
15	22	4.40	2.20	1.100
20	29	5.87	2.93	1.467
25	37	7.33	3.67	1.833
30	44	8.80	4.40	2.200
35	51	10.27	5.13	2.567
40	59	11.73	5.97	2·933
45	66	13.20	6.60	3.300
50	73	14.67	7.33	3.667
55	80	16.13	8.06	4.033
60	88	17.60	8.80	4.400
75	110	22.00	11.00	5.500
100	147	29.33	14.67	7.333
125	183	36.67	18.33	9.167
150	220	44.00	22.00	11.000

DIAGRAM OF COMPARATIVE EXPOSURES.

Computed for the latitude of Washington, D. C. (38 deg., 54 min., N.)

By Lieut. Commander S. W. Very, U. S. N.



The straight lines in this diagram represent divisions of time; the vertical ones showing the month and day, and the horizontal ones the time of day as shown by a sun-dial.

The curved lines are curves of equal altitudes of the sun, computed for the latitude of Washington, for the year 1889.

The combination of the two systems of lines is designed to enable the photographer, whether amateur or professional, who has at some time determined the length of exposure required under certain circumstances of subject, clouds, lens, diaphragm, plate or film, etc., to decide what exposure to give *under the same circumstances*, at any time between sunrise and sunset, on any day of the year.

The diagram is based upon one constructed for the latitude of London, published in the *Photographic News*, in 1887, and reprinted in the ANNUAL of 1888, and the same standard of comparison is used in this adaptation—that is, such circumstances of subject, clouds, lens, diaphragm, plate or film, etc., as will require an exposure of one second, at noon of any day between the 4th of April and the 7th of September, or at any time between a quarter to ten in the forenoon and a quarter past two in the afternoon on the 21st of June.

The diagram, although constructed for the year 1889, and for the latitude of Washington, will serve equally well for any other year, and well enough for ordinary purposes, throughout the United States (exclusive of Alaska), although in the extreme Northern and Southern belts it will not be accurate.

The diagram is strictly accurate for "apparent time" only, but it is sufficiently so for "local mean time" (which may differ sixteen minutes from "apparent time"), and in the great majority of places for "standard time" (which in some places differs half an hour from "mean time," and may differ three-quarters of an hour from "apparent time").

EXAMPLES.

Q. With a certain lens, diaphragm, etc., it is found that on the 20th of July, at 9.30 A.M., a certain subject requires three seconds' exposure; what time should be given on the 10th of December, at 3.30 P.M., the subject, lens, etc., being the same?

A. Fifteen seconds.

Q. At noon of the 15th of May, a certain subject required ten seconds; what length of exposure should be given to the same subject, with the same lens, diaphragm, etc., on the 1st of November, at 8 A M.?

A. Forty-five seconds.

TABLE OF COMPARATIVE LIGHT VALUES.

By Rev. Dwight W. Smith.

While there is a wider range in timing the exposure of a dry plate than is generally supposed, yet it is well known that there is but one correct interval for the best results with a normal developer. To best approximate that interval at all available hours of the day and year requires some attention and experience. There was a time when plates of a given brand and sensitiveness were quite unreliable, but now that they are so uniform, and improving more and more in this direction, tables of light values that were found to be comparatively useless will now be found of increasing value. The subjoined table, based upon the diagram in this book, by Lieutenant S. W. Very, U. S. N., has been computed for the first half of each month, and at a glance one may obtain information that would otherwise require time and trouble, and that even skill and experience does not always provide for, especially during the time indicated in which there is a rapid loss of light. It will be seen that in January, the light value for noon is given as 1.7, while at 4 P.M. the exposure would necessarily be more than five times that duration. For July, the most rapid as well as longest available light of any month, the light at noon is indicated by .2 instead of 1.7, and at 3 P.M. more than twice the time will be required.

The first column indicates the hour of the day; the second column the comparative light values in whole numbers and tenths.

JANUARY.		FEBRUARY.		MARCH.		APRIL.	
8	10	8	6	8	3	8	2
9	4	9	4	9	2	9	1.5
10	2.5	10	2	10	1.5	10	1.7
11	2	11	1.7	11	1.2	11	1
12	1.7	12	1.5	12	1	12	1
1	1.7	1	2	1	1	1	1
2	2.5	2	2.7	2	1.7	2	1.2
3	4.5	3	3.5	3	2	3	1.5
4	9	4	5	4	4	4	2
		5	60	5	20	5	4
						6	20

MAY.		JUNE.		JULY.		AUGUST.	
8	1.7	8	1.7	8	1.5	8	1.7
9	1.2	9	1.2	9	1.2	9	1.5
10	1	10	1	10	1	10	1
11	.7	11	.6	11	.5	11	.7
12	.5	12	.3	12	.2	12	.5
1	.7	1	.5	1	.5	1	.5
2	1	2	.7	2	1	2	1
3	1.2	3	1.2	3	1.2	3	1.2
4	1.5	4	1.5	4	1.5	4	1.7
5	2.7	5	2.2	5	2.2	5	2.5
6	15	6	5	6	4	6	5
7	80	7	20	7	15	7	60

SEPTEMBER.		OCTOBER.		NOVEMBER.		DECEMBER.	
8	2	8	3	8	4	8	9
9	1.5	9	1.7	9	3	9	3
10	1	10	1.5	10	2	10	2
11	1	11	1.2	11	1 7	11	1.5
12	.5	12	1	12	1.5	12	1.7
1	1	1	1.2	1	1.5	1	2
2	1.2	2	1.5	2	2	2	2.5
3	1.5	3	2	3	2.5	3	3.5
4	2	4	2.7	4	5	4	8
5	3	5	6	5	20	5	80
6	10	6	40	6	70		

PROF. BURTON'S TABLE OF COMPARATIVE EXPOSURES.

Apertures Calculated on the Standard System of the Photographic Society.	Sea and Sky.	Open Landscape.	Landscape with heavy foliage in foreground.	Under Trees, up to		Fairly Lighted Interiors.		Badly Lighted Interiors, up to		Portraits in bright diffused Light out of doors.	Portraits in good Studio Light.		Portraits in Ordinary Room.	
				mins.	secs.	mins.	secs.	hrs.	mins.		mins.	secs.	mins.	secs.
No. 1, or $\frac{f}{4}$	$\frac{1}{100}$ sec.	$\frac{1}{50}$ sec.	$\frac{1}{8}$ sec.	0	10	0	10	0	2	$\frac{1}{6}$ sec.	0	1	0	4
No. 2, or $\frac{f}{5.657}$	$\frac{1}{80}$ sec.	$\frac{1}{25}$ sec.	$\frac{1}{4}$ sec.	0	20	0	20	0	4	$\frac{1}{3}$ sec.	0	2	0	8
No. 4, or $\frac{f}{8}$	$\frac{1}{40}$ sec.	$\frac{1}{12}$ sec.	$\frac{1}{2}$ sec.	0	40	0	40	0	8	$\frac{2}{3}$ sec.	0	4	0	16
No. 8, or $\frac{f}{11.314}$	$\frac{1}{20}$ sec.	$\frac{1}{6}$ sec.	1 sec.	1	20	1	20	0	16	$1\frac{1}{3}$ sec.	0	8	0	32
No. 16, or $\frac{f}{16}$	$\frac{1}{10}$ sec.	$\frac{1}{3}$ sec.	2 secs.	2	40	2	40	0	32	$2\frac{2}{3}$ secs.	0	16	1	4
No. 32, or $\frac{f}{22.627}$	$\frac{1}{5}$ sec.	$\frac{2}{3}$ sec.	4 secs.	5	20	5	20	1	4	$5\frac{1}{3}$ secs.	0	32	2	8
No. 64, or $\frac{f}{32}$	$\frac{2}{5}$ sec.	$1\frac{1}{3}$ sec.	8 secs.	10	40	10	40	2	8	$10\frac{2}{3}$ secs.	1	4	4	16
No. 128, or $\frac{f}{45.255}$	$\frac{4}{5}$ sec.	$2\frac{2}{3}$ secs.	16 secs.	21	20	21	20	4	16	21 secs.	2	8	8	32
No. 256, or $\frac{f}{64}$	$1\frac{3}{5}$ sec.	$5\frac{1}{3}$ secs.	32 secs.	42	40	42	40	8	32	42 secs.	4	16	17	4

LANTERNISTS' READY REFERENCE TABLE.

(From Optical Magic Lantern Journal.)

If A=focal length of objective, B=diameter of slide, C=diameter of disc on screen, D=distance between objective and screen, then $D=\frac{C \times A}{B}$ $A=\frac{D \times B}{C}$ $C=\frac{D \times B}{A}$

The following table has been computed by these rules and will show by a glance the relations between the size of disc and distance from screen for object glasses of all foci from 4 inches to 15 inches. The diameter of slide is taken as 3 inches, that being the usual opening of the mat.

Distance between Lantern and Screen.	FOCUS OF LENS.																							
	4in.		5in.		6in.		7in.		8in.		9in.		10in.		11in.		12in.		13in.		14in.		15in.	
	DIAMETER OF DISC.																							
	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
10 feet.	7	6	6	0	5	0	4	3	3	9	3	4	3	0	2	9	2	6	2	4	2	2	2	0
11 "	8	3	6	7	5	6	4	9	4	2	3	8	3	4	3	0	2	9	2	6	2	4	2	2
12 "	9	0	7	2	6	0	5	2	4	6	4	0	3	7	3	3	3	0	2	9	2	7	2	5
13 "	9	9	7	10	6	6	5	7	4	11	4	4	3	11	3	7	3	3	3	0	2	9	2	7
14 "	10	6	8	5	7	0	6	0	5	3	4	8	4	2	3	10	3	7	3	3	3	0	2	9
15 "	11	3	9	0	7	6	6	5	5	8	5	0	4	6	4	1	3	9	3	6	3	3	3	0
20 "	15	0	12	0	10	0	8	7	7	6	6	8	6	0	5	6	5	0	4	7	4	3	4	0
25 "	18	9	15	0	12	6	10	9	9	4	8	4	7	6	6	10	6	3	5	0	5	4	5	0
30 "	22	6	18	0	15	0	12	10	11	3	10	0	9	0	8	2	7	6	6	11	6	5	6	0
35 "	26	3	21	0	17	6	15	0	13	1	11	8	10	6	9	6	8	9	8	1	7	6	7	0
40 "	30	0	24	0	20	0	17	2	15	0	13	4	12	0	10	10	10	0	9	2	8	6	8	0
45 "	33	9	27	0	22	6	19	3	16	10	15	0	13	6	12	3	11	3	10	4	9	8	9	0
50 "	37	6	30	0	25	0	21	5	18	9	16	8	15	0	13	8	12	6	11	6	10	9	10	0

EXAMPLES.—An 8in. focus lens at a distance of 35ft. will give a disc of 13ft. 1in. To produce a disc of 12ft. with a lens of 10in. focus, the lantern and screen must be separated by 40ft. To produce a disc of 15ft. at a distance of 45ft. will require a lens of 9in. focus.

TABLE FOR ENLARGEMENT AND REDUCTION.

COMPUTED FOR CENTIMETERS OR INCHES.

Equivalent Focus of the Lens.	Distances of the Object and the Ground Glass Screen from the Center of the Objective.																								
	1 *t.*	2 *t.*	3 *t.*	4 *t.*	5 *t.*	6 *t.*	7 *t.*	8 *t.*	9 *t.*	10 *t.*	11 *t.*	12 *t.*	13 *t.*	14 *t.*	15 *t.*	16 *t.*	17 *t.*	18 *t.*	19 *t.*	20 *t.*	21 *t.*	22 *t.*	23 *t.*	24 *t.*	25 *t.*
5..	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130
	10	7.5	6.7	6.2	6	5.8	5.7	5.6	5.6	5.5	5.5	5.4	5.4	5.4	5.3	5.3	5.3	5.3	5.3	5.3	5.2	5.2	5.2	5.2	5.2
6..	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132	138	144	150	156
	12	9	8	7.5	7.2	7	6.9	6.8	6.7	6.6	6.5	6.5	6.5	6.4	6.4	6.4	6.4	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.2
7..	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147	154	161	168	175	182
	14	10.5	9.3	8.8	8.4	8.2	8	7.9	7.8	7.7	7.6	7.6	7.5	7.5	7.5	7.4	7.4	7.4	7.4	7.4	7.3	7.3	7.3	7.3	7.3
8..	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160	168	176	184	192	200	208
	16	12	10.7	10	9.6	9.3	9.1	9	8.8	8.8	8.7	8.7	8.6	8.6	8.5	8.5	8.5	8.4	8.4	8.4	8.4	8.4	8.3	8.3	8.3
9..	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	162	171	180	189	198	207	216	225	234
	18	13.5	12	11.3	10.8	10.5	10.3	10.1	10	9.9	9.8	9.8	9.7	9.6	9.6	9.6	9.5	9.5	9.5	9.5	9.4	9.4	9.4	9.4	9.4
10..	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260
	20	15	13.3	12.5	12	11.7	11.4	11.3	11.1	11	10.9	10.8	10.8	10.7	10.7	10.6	10.6	10.6	10.5	10.5	10.5	10.5	10.4	10.4	10.4
11..	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	187	198	209	220	231	242	253	264	275	286
	22	16.5	14.7	13.8	13.2	12.8	12.6	12.4	12.2	12.1	12	11.9	11.8	11.8	11.7	11.7	11.6	11.6	11.6	11.6	11.5	11.5	11.5	11.5	11.4
12..	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240	252	264	276	288	300	312
	24	18	16	15	14.4	14	13.7	13.5	13.3	13.2	13.1	13	12.9	12.9	12.8	12.7	12.7	12.7	12.6	12.6	12.6	12.5	12.5	12.5	12.5
13..	26	39	52	65	78	91	104	117	130	143	156	169	182	195	208	221	234	247	260	273	286	299	312	325	338
	26	19.5	17.3	16.3	15.6	15.2	14.9	14.6	14·4	14.3	14.2	14.1	14	13.9	13.9	13.8	13.8	13.7	13.7	13.7	13.6	13.6	13.6	13.5	13.5
14..	28	42	56	70	84	98	112	126	140	154	168	182	196	210	224	238	252	266	280	294	308	322	336	350	364
	28	21	18.7	17.5	16.8	16.3	16	15.8	15.6	15.4	15.3	15.2	15.1	15	14.9	14.9	14.8	14.8	14.7	14.7	14.7	14.6	14.6	14.6	14.6
15..	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240	255	270	285	300	315	330	345	360	375	390
	30	22.5	20	18.8	18	17.5	17.1	16.9	16.7	16.5	16.4	16.3	16.2	16.1	16	15.9	15.9	15.8	15.8	15.8	15.7	15.7	15.7	15.6	15.6

16..	32	48	64	80	96	112	128	144	160	176	192	208	224	240	256	272	288	304	320	336	352	368	384	400	416
	32	24	21.3	20	19.2	18.7	18.3	18	17.8	17.6	17.5	17.3	17.2	17.1	17.1	17	16.9	16.9	16.8	16.8	16.8	16.7	16.7	16.7	16.6
17..	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306	323	340	357	374	391	408	425	442
	34	25.5	22.7	21.3	20.4	19.8	19.4	19.1	18.9	18.7	18.5	18.4	18.3	18.2	18.1	18.1	18	17.9	17.9	17.9	17.8	17.8	17.7	17.7	17.7
18..	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	378	396	414	432	450	468
	36	27	24	22.5	21.6	21	20.6	20.3	20	19.8	19.6	19.5	19.4	19.3	19.2	19.1	19.1	19	18.9	18.9	18.9	18.8	18.8	18.8	18.7
19..	38	57	76	95	114	133	152	171	190	209	228	247	266	285	304	323	342	361	380	399	418	437	456	475	494
	38	28.5	25.3	23.8	22.8	22.2	21.7	21.4	21.1	20.9	20.7	20.6	20.5	20.4	20.3	20.2	20.1	20.1	20	20	19.9	19.9	19.8	19.8	19.8
20..	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	520
	40	30	26.7	25	24	23.3	22.9	22.5	22.2	22	21.8	21.7	21.5	21.4	21.3	21.3	21.2	21.1	21.1	21	21	20.9	20.9	20.8	20.8
21..	42	63	84	105	126	147	168	189	210	231	252	273	294	315	336	357	378	399	420	441	462	483	504	525	546
	42	31.5	28	26.3	25.2	24.5	24	23.6	23.3	23.1	22.9	22.8	22.6	22.5	22.4	22.3	22.2	22.2	22.1	22.1	22	22	21.9	21.9	21.8
22..	44	66	88	110	132	154	176	198	220	242	264	286	308	330	352	374	396	418	440	462	484	506	528	550	572
	44	33	29.3	27.5	26.4	25.7	25.1	24.8	24.4	24.2	24	23.8	23.7	23.6	23.5	23.4	23.3	23.2	23.2	23.1	23	23	23	22.9	22.9
23..	46	69	92	115	138	161	184	207	230	253	276	299	322	345	368	391	414	437	460	483	506	529	552	575	598
	46	34.5	30.7	28.8	27.6	26.8	26.3	25.9	25.6	25.3	25.1	24.9	24.8	24.6	24.5	24.4	24 4	24.3	24.2	24.2	24.1	24	24	24	23.9
24..	48	72	96	120	144	168	192	216	240	264	288	312	336	360	384	408	432	456	480	504	528	552	576	600	624
	48	36	32	30	28.8	28	27.4	27	26.7	26.4	26.2	26	25.8	25.7	25.6	25.5	25.4	25.3	25.3	25.2	25.1	25.1	25	25	25
25..	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650
	50	37.5	33.3	31.3	30	29.2	28.6	28.1	27.8	27.5	27.3	27.1	26.9	26.8	26.7	26.6	26.5	26.4	26.3	26.3	26.2	26.1	26.1	26	26

The use of the above table will best be explained by illustrations:

To enlarge six times with a lens of 15 centimeters (or inches) focal length. We find in the table under 6 *t.* and opposite 15, the figures $\frac{105}{17.5}$, hence the object must be 17.5, and the screen 105 centimeters (or inches) from the centre of the lens.

To reduce eight times with a lens of 19 centimeters (or inches) focus, the object must be 171 and the screen 21.4 centimeters (or inches) from centre of lens.

The table can be formulated thus: Where p = focal length of lens, a = distance from ground-glass to centre of lens and b = distance from object to centre of lens, then $\frac{1}{a} + \frac{1}{b} = \frac{1}{p}$

AMERICAN, FRENCH, ENGLISH AND GERMAN MONEY.

American.	French.	English.	German.	American.	French.	English.	German.
dols. c.	*fr. c.*	*s. d.*	*m. pf.*	*dols. c.*	*fr. c.*	*s. d.*	*m. pf.*
0 01	0 05	0 0½	0 04		2 87.5		2 30
0 02	0 10	0 1	0 08	0 56	2 92	2 4	
	0 12.5		0 10		**3 00**		**2 40**
0 03	0 15	0 1½	0 12	0 58	3 02	2 5	
	0 20		0 16	**0 60**	**3 12.5**	**2 6**	**2 50**
0 04	0 21	0 2		0 62	3 23	2 7	
	0 25		0 20		3 25		2 60
0 05	**0 26**	**0 2½**		0 64	3 33	2 8	
0 06	0 31	0 3	0 25		3 37.5		2 70
	0 37.5		0 30	0 66	3 44	2 9	
0 08	0 42	0 4			3 50		2 80
	0 50		0 40	0 68	3 54	2 10	
0 10	0 52	0 5			3 62.5		2 90
0 12	**0 62.5**	0 6	**0 50**	0 70	3 65	2 11	2 92
0 14	0 73	0 7		**0 72**	**3 75**	**3 0**	**3 00**
	0 75		0 60	0 74	3 85	3 1	3 08
0 16	0 83	0 8			3 87.5		3 10
	0 87.5		0 70	0 76	3 96	3 2	
0 18	0 94	0 9			**4 00**		**3 20**
	1 00		**0 80**	0 78	4 06	3 3	
0 20	1 04	0 10			4 12.5		3 30
	1 12.5		0 90	**0 80**	4 17	3 4	
0 22	1 15	0 11			4 25		3 40
0 24	**1 25**	**1 0**	**1 00**	0 82	4 27	3 5	
0 25	1 30	1 0½	1 04	**0 84**	**4 37.5**	**3 6**	**3 50**
0 26	1 35	1 1	1 08	0 86	4 48	3 7	
	1 37.5		1 10		4 50		3 60
0 28	1 46	1 2		0 88	4 58	3 8	
	1 50		1 20		4 62.5		3 70
0 30	1 56	1 3		0 90	4 69	3 9	
	1 62.5		1 30		4 75		3 80
0 32	1 67	1 4		0 92	4 79	3 10	
	1 75		1 40		4 87.5		3 90
0 34	1 77	1 5		0 94	4 90	3 11	
0 36	**1 87.5**	**1 6**	**1 50**	**0 96**	**5 00**	**4 0**	**4 00**
0 38	1 98	1 7		1 00	5 21	4 2	4 16
	2 00		1 60	1 20	6 25	5 0	5 00
0 40	2 08	1 8		1 44	7 50	6 0	6 00
	2 12.5		1 70	1 68	8 75	7 0	7 00
0 42	2 19	1 9		1 92	10 00	8 0	8 00
	2 25		1 80	2 16	11 25	9 0	9 00
0 44	2 29	1 10		2 40	12 50	10 0	10 00
	2 37.5		1 90	2 64	13 75	11 0	11 00
0 46	2 40	1 11	1 92	2 88	15 00	12 0	12 00
0 48	**2 50**	**2 0**	**2 00**	3 84	20 00	16 0	16 00
0 50	2 60	2 1	2 08	4 80	25 00	20=£1	20 00
	2 62.5		2 10	9 60	50 00	£2	40 00
0 52	2 71	2 2		14 40	75 00	£3	60 00
	2 5		2 20	19 20	100 00	£4	80 00
0 54	2 81	2 3		24 00	125 00	£5	100 00

STANDARD OF FOREIGN COINS FOR CUSTOMS PURPOSES

As Proclaimed by the Director of the United States Mint, January 1, 1890, and Corrected to Date.

The Value of Imports for the Assessment of Duties is ascertained by converting Currency of Invoice into Money of the United States, as per following Table:

Country.	Unit of Currency.	Sign.	Value in U. S. Cur.
Argentine Republic	Peso =100 Centavos	$	.96.5
Austria-Hungary	Florin =100 Kreutzer	Fl.	.34.5
Azores	Milreis =100 Reis	Rs. $	.83.5
Belgium	Franc =100 Centimes	Frs.	.19.3
Bolivia	Boliviano =10 Reales	$	.69.8
Brazil	Milreis =1000 Reis	Rs. $	.54.6
British North America. *Ex. Newfoundland*	Dollars =100 Cents	$	1.00
Chili	Peso =100 Centavos	$	.91.2
China (*Haikwan*)	Tael =10 Mace	Tael.	1.14.8
Columbia, U. S. of	Peso =100 Centavos	$	.69 8
Costa Rica	Peso =100 Centavos	$	.69.8
Cuba	Peso =100 Centavos	$	.92.6
Denmark	Krone =100 Ore	Kr.	.26.8
Ecuador	Sucre =100 Centavos	$	.69.8
Egypt	Pound =100 Piastres	£	4.94.3
France	Franc =100 Centimes	Frs.	.19.3
Germany	Mark =10 Pfennige	Mks.	.23.8
Great Britain	Pound Sterling =20 Shillings	£	4.86.65
Greece	Drachma =100 Lepta	Dr.	.19.3
Guatemala	Peso =100 Centavos	$	.69.8
Hayti	Gourde =100 Cents	$	.69.5
Honduras	Peso =100 Centavos	$	.69.8
India	Rupee =16 Annas	Rs.	.33.2
Italy	Lira =100 Centesimi	L.	.19.3
Japan	Yen =100 Sen Gold	Yen.	.99.7
do	do. = do. Silver	Yen.	.75.2
Liberia	Dollar =100 Cents	$	1.00
Mexico	Peso =100 Centavos	$	.75.8
Netherlands	Florin =100 Cents	$	.40.2
Newfoundland	Dollar =100 Cents	$	1.01.4
Nicaragua	Peso =100 Centavos	$	.69.8
Norway	Krone =100 Ore	Kr.	.26.8
Paraguay	Peso =100 Centavos	$	1.00
Peru	Sol =100 Centavos	$	.69.8
Porto Rico	Peso =100 Centavos	$	.92.5
Portugal	Milreis =1000 Reis	Rs. $	1.08
Russia	Rouble =100 Copecks	S. Ro.	.55.8
Salvador	Peso =100 Centavos	$	.69.8
Sandwich Islands	Dollar =100 Cents	$	1.00
Spain	Peseta =100 Centimos	Ptas.	.19.3
Sweden	Krone =100 Ore	Kr.	.26.8
Switzerland	Franc =100 Centimes	Frs.	.19.3
Tripoli	Mahbub =20 Piastres	$	.62.9
Tunis	Piastre =16 Caroubs	Ptrs.	.11.8
Turkey	Piastre =30 Paras	Ptrs.	.04.4
Uruguay	Patacon =100 Centavos	$	.94.9
Venezuela	Bolivar =100 Centimos	Brs.	.14

USUAL SIZES OF FRENCH, GERMAN AND ITALIAN DRY PLATES.

French and German.	*Inches.*	Italian.	*Inches.*
6½x 9 Centimetres	2.5x 3.6	9x12 Centimetres	3.6x 4.7
9 x12 "	3.6x 4.7	12x16 "	4.7x 6.3
12 x15 "	4.7x 5.9	12x18 "	4.7x 7.2
13 x18 "	5.1x 7.0	13x18 "	5.1x 7.0
12 x20 "	4.7x 7.8	12x20 "	4.7x 7.8
15 x21 "	5.9x 8.2	18x24 "	7.0x 9.4
15 x22 "	5.9x 8.6	21x27 "	8.2x10.6
18 x24 "	7.2x 9.4	24x30 "	9.4x11.8
21 x27 "	8.2x10.6	27x33 "	10.6x12.9
24 x30 "	9.4x11.8	30x36 "	11.8x14.1
27 x33 "	10.6x12.9	40x50 "	15.7x19.6
27 x35 "	10.6x13.7	50x60 "	19.6x23.6
30 x40 "	11.8x15.7		
40 x50 "	15.7x19.6		
50 x60 "	19.6x23.6		

SIZES OF GLASS, MOUNTS, PAPER, ETC.

Petite cards	1⅝x3⅛
One-ninth plate	2 x2½
One-sixth plate	2¾x3¼
One-fourth plate	3¼x4¼
Half plate 4¼x5½ and	4¼x6½
Half plate (English)	4¾x6½
Whole plate (4–4)	6½x8½
Extra 4–4	8 x10

Other sizes are expressed by inches.

Sizes of Mounts.

Stereoscopic	3½x7, 4x7, 4¼x7, 4½x7, 5x8		
Victoria	3¼x5	Minette	1½x2⅜
Imperial	7⅞x9⅞	Card	2½x4⅛
Boudoir	5¼x8½	Cabinet	4¼x6½
Panel	4 x8¼	Promenade	4⅛x7⅛

Sizes of Albumen Paper.

18x22¾, 20½x24½, 22x36, 26x40, 27x42.

Size of blotting paper 19x24

FREEZING MIXTURES.

Parts.	Reducing the Temperature From Degrees of the Celsius	To Thermometer.
3 Nitrate of sodium + 4 Water	+13.2 deg.	— 5.3 deg.
9 Phosphate of sodium + 4 dilute Nitric acid	+10 "	— 9 "
3 Sulphate of sodium + 2 dilute Nitric acid	+10 "	—10 "
1 Nitrate of sodium + 4 Water	.....	—10.6 "
1 Chloride of potassium + 4 Water	.....	—11.8 "
5 Sal ammoniac + 5 Saltpetre + 16 Water	+10 deg.	—12 "
1 Nitrate of ammonia + 1 Water	+10 "	—15.5 "
8 Sulphate of sodium + 5 conc. Sulphuric acid	+10 "	—17 "
1 Sulphocyanate of Potass. + 1 Water	+18 "	—21 "
1 Chloride of sodium + 3 Snow	.....	—21 "
1 Sal ammoniac + 1 Saltpetre + 1 Water	+ 8 deg.	—24 "
3 Crystal. chloride of calcium + 1 Snow	.....	—36 "
1 Snow + 1 dilute Sulphuric acid	— 5 deg.	—41

LIST OF THE PRINCIPAL CHEMICALS USED IN PHOTOGRAPHY, WITH ENGLISH, LATIN, GERMAN AND FRENCH NAMES.

COMPILED BY C. L. LOCHMAN.

ENGLISH.	LATIN.	GERMAN.	FRENCH.
Acid Acetic	Acidum aceticum	Essigsäure	Acide acetique.
" " Glacial	Acidum aceticum glaciale.	Eisessig	Vinaigre glacial.
" Chromic	Acidum chromicum	Chromsäure	Acide chromique.
" Citric	Acidum citricum	Citronensäure	Acide citrique.
" Gallic	Acidum gallicum	Gallussäure	Acide gallique.
" Hydrochloric	Acidum hydrochloricum.	Salzsäure	Acide chlorhydrique.
" *Muriatic.*			
" Nitric	Acidum nitricum	Salpetersäure	Acide nitrique (azotique).
" Oxalic	Acidum oxalicum	Oxalsäure	Acide oxalique.
" Pyrogallic; Pyrogallol.	Acidum pyrogallicum.	Pyrogallussäure; Pyrogallol.	Acide pyrogallique.
" Tartaric	Acidum tartaricum	Weinsteinsäure	Acide tartarique.
" Sulphuric	Acidum sulphuricum	Schwefelsäure	Acide sulfurique.
" Tannic; Tannin.	Acidum tannicum.	Gerbsäure	Acide tannique.
Alcohol, Ethyl	Alcohol	Weingeist	Alcool.
Alcohol, Wood	Alcohol methylicum	Holzgeist	Alcool methylique.
Alum, Ammonia	Aluminii et ammonii sulphas.	Ammoniak-Alaun	Sulphate d'alumine et d'ammoniaque.
Alum, Chrome	Chromii et potassii sulphas.	Chrom-Alaun	Alun chromi-potassique.
Alum, Potassa	Aluminii et potassii sulphas.	Kali-Alaun	Sulfate d'alumine et de potasse.
Ammonium Bichromate.	Ammonii bichromicum	Dobletchromsaures Ammon.	Bichromate d'ammoniaque.
Ammonium Nitrate	Ammonii nitras	Ammoniumnitrat	Azotated'ammionaque
Benzin	Benzinum	Petroleumbenzin	Benzine.
Benzol	Benzolum	Benzol	Benzole.
Bromine	Bromum; Brominium	Brom	Brome.
Cadmium Bromide	Cadmii bromidum	Kadmiumbromid; Bromkadmium.	Bromure de cadmium.
Cadmium Iodide	Cadmii iodidum	Kadmiumjodid; Jodkadmium.	Iodure de cadmium.
Calcium Bromide	Calcii bromidum	Bromcalcium	Bromure de calcium.
" Carbonate	Calcii carbonas	Calciumcarbonat	Carbonate de calcium.
" Iodide	Calcii iodidum	Jodcalcium	Iodure de calcium.
Chloroform	Chloroformum	Chloroform	Choloforme.
Collodion	Collodium	Collodion	Collodion.
Dextrin	Dextrinum	Stärkegummi	Dextrine.
Eikonogen.	Eikonogen	Eikonogen	Eikonogen.
Ether (Sulphuric)	Aether (sulphuricus)	Aether; Schwefeläther	Ether sulfurique.
Gelatin	Gelatina	Gelatin	Gelatine.
Glycerin	Glycerinum	Glycerin	Glycerine.
Gold	Aurum	Gold	Or.
" Chloride,	Auri Chloridum	Goldchlorid	Chlorure d'or.
" and Sodium Chloride.	Auri et sodii chloridum	Natriumgoldchlorid	Chlorure d'or et de Sodium
Gum Arabic	Gummi Arabicum	Arabisches Gummi	Gomme Arabique.
Gum Sandarac	Sandaraca	Sandarak	Sandaraque.
Gum Shellac	Ressina lacca	Lack; Gummilack	Laque.
Hydrochinon; Hydroquinon.	Hydrochinonum	Hydrochinon	Hydrochinon.
Iodine	Iodum; Iodinium	Jod	Iode.
Iron Sulphate	Ferri sulphas	Ferrosulfat	Sulfate de fer.
Lithium Bromide	Lithii bromidum	Bromlithium	Bromure de lithium.
" Iodide	Lithii iodidum	Jodlithium	Iodure de lithium.
Magnesium Bromide	Magnesii bromidum	Brommagnesium	Bromuredemagnesium
" Iodide	Magnesii iodidum	Jodmagnesium	Iodure de magnesium.
" Sulphate	Magnesii sulphas	Magnesiumsulfat	Sulfate de magnesie.
Mercury Bichloride	Hydrargyri bichloridum.	Aetzendes Quecksilber-chlorid.	Deutochlorure de mercure.

LIST OF THE PRINCIPAL CHEMICALS, ETC.—*Continued.*

ENGLISH.	LATIN.	GERMAN.	FRENCH.
Oil of Lavender	Oleum Lavandulæ	Lavendelöl	Essence de Lavand.
Oil of Turpentine	Oleum Terebinthinæ	Terpintinöl	Essence Terebinthine.
Platinum Chloride	Platini chloridum	Platinchlorid	Perchlorure de platine
Platino-Potassium Chloride.	Platini et Potassii chloridum.	Kali-Platinumchlorid	Chlorure de platinum et de potassium.
Potassa, Sulphurated ; Lilver of Sulphur.	Potassa sulphurata	Schwefelleber	Sulfure de potasse.
Potassium Bichromate	Potassii bichromas	Kaliumbichromat	Bichromate de potasse
" Bromide	Potassii Bromidum	Kaliumbromid	Bromure de potassium
" Carbonate	Potassii carbonas	Kaliumcarbonat	Carbonate de potasse.
" Cyanide	Potassii cyanidum	Cyankalium	Cyanure de potassium.
" Ferricyanide	Potassii ferricyanidum	Ferridcyankalium	Ferricyanure de potassium.
" Ferrocyanide	Potassii ferrocyanidum	Ferrocyankalium	Ferrocyanure de potassium.
" Hydrate ; Potassa.	Potassii hydras ; Potassa.	Aetzkali	Potasse caustique.
" Iodide	Potassii iodidum	Jodkalium	Iodure de potassium.
" Oxalate, neutral.	Potassii oxalas	Kalium Oxalat, neutrales.	Oxalate de potasse neutre.
" Sulphite	Potassii sulphis	Kaliumsulfit	Sulfite de potassium.
" Sulphocyanide	Potassii sulphocyanidum.	Kalium sulfocyanat ; Rhodankalium.	Sulfocyanure de potassium.
Pyroxylin ; Gun Cotton.	Pyroxylinum	Collodionwolle ; Schiess-baumwolle.	Pyroxyle; Fulmi-coton
Silver	Argentum	Silber	Argent.
" Nitrate	Argenti nitras	Silbernitrat	Nitrate d'argent.
" Oxide,	Argenti oxidum	Silber Oxyd	Oxyde d'argent.
Sodium Acetate	Sodii acetas	Natriumacetat	Acetate de soude.
" Biborate ; Borax.	Sodii biboras	Natrium borat; Borax.	Borate de soude.
" Bicarbonate	Sodii bicarbonas	Natriumbicarbonat	Bicarbonate de soude.
" Bromide	Sodii bromidum.	Bromnatrium	Bromure de sodium.
" Carbonate	Sodii carbonas	Natriumcarbonat	Carbonate de soude.
" Chloride	Sodii chloridum	Chlornatrium	Chlorure de sodium
" Citrate	Sodii citras	Natriumcitrat; Citronensaures Natron.	Citrate de soude.
" Hydrate ; Soda	Sodii hydras ; Soda	Aeznatron	Soude caustiqne.
" Hyposulphite or Thiosulphate.	Sodii hyposulphis.	Unterschwefligsaures Natron.	Hyposulphite de soude
" Iodide	Sodii iodidum	Jodnatrium	Iodure de sodium.
" Sulphite	Sodii sulphis	Natrium sulfit	Sulfite de soude.
" Tungstate	Sodii tungstas	Wolfraumsaures Natron.	Tungstate de soude.
Starch	Amylum	Stärke; Stärkmehl	Amidon.
Strontium Bromide	Strontii bromidum	Bromstrontium	Bromure de strontium.
" Chloride	Strontii chloridum	Chlorstrontium.	Chlorure de strontium.
" Iodide.	Strontii iodidum	Jodstrontium	Iodure de strontium.
Tannin, see Tannic Acid.			
Turpentine, Crude or White.	Terebinthina communis	Geweiner Terpentin	Terebenthine commune.
Uranium Bromide	Uranii bromidum	Bromuranium	Bromure d'uranium.
Uranium Nitrate	Uranii nitras	Salpetersaures Uranoxyd.	Nitrate d'urane.
Water, Distilled	Aqua destillata	Destillirtes Wasser	Eau distillée.
Water of Ammonia	Aqua ammoniæ	Salmiakgeist ; Ammoniak-Flüssigkeit.	Eau d'ammoniaque.
Zinc Bromide	Znci bromidum	Zinkbromid ; Bromzink.	Bromure de zinc.
Zinc Chloride	Zinci chloridum	Chlorzink	Chlorure de zinc.
Zinc Iodide	Zinci iodidum	Zinkjodid ; Jodzink	Iodure de zinc.

PHOTOGRAPHIC SCHOOLS OF INSTRUCTION.

AMERICAN.

CHAUTAUQUA SCHOOL OF PHOTOGRAPHY. Headquarters, 423 Broome Street, New York. In the Summer months, Chautauqua Assembly Grounds, N. Y. Prof. Charles Ehrmann, *Instructor*. 1. *Corresponding Class*.—Printed Lessons; Reading of Hand-books; Instruction by Correspondence. 2. *Practicing Class*.—Practical Exercises in Field and Studio; Theories; Public Lectures; Colloquies. 3. *Local Class, New York*—Demonstration in Practical Photography; Theory of Photo-chemical Processes; Preparation of Photographic Chemicals. 4. *Corresponding Class* (*Second Course*).—Prescribed Reading; Chemistry; Optics; Examination in all classes; Diplomas.

ANN ARBOR UNIVERSITY, MICHIGAN. *Director*, Prof. A. B. Stevens. Theory and Practice; Special Instructions in Photo-micrography; Lectures on Photo-mechanical Processes. It is obligatory for the students to have passed two courses in Chemistry. Examination and Diplomas.

CORNELL UNIVERSITY, ITHACA, N. Y. A School of Photography, under Direction of Prof. Mohr, is in connection with the University.

MAINE STATE COLLEGE, ORONO, MAINE. *Instructor*, Assist. Prof. D. W. Colby.

EUROPEAN.

PHOTOGRAPHICAL LABORATORY OF THE POLYTECHNICUM IN CHARLOTTENBURG, BERLIN. Prof. Schlichting, *Director*. Prof. Dr. H. W. Vogel, *Instructor*. Chemistry, Physics, Drawing, Practical Exercises and Photo-mechanical Printing Methods.

BRAUNSCHWEIG DEPARTMENT OF POLYTECHNICAL SCHOOL. Prof. Dr. C. Koppe and Dr. Max Muller. Theory and Practice; Photo-micrography; Photo-grammetry.

KARLSRUHE. Prof. Dr. Schuberg. Theory and Practice in Studio and Field; Lectures.

MUNICH. Dr. M. Th. Edmann. Photography Applied to the Mechanical Arts.

SCHLOSS GRÖNENBACH, BAVARIA. W. Cronenberg. Mechanical Printing Methods; Wet and Dry Processes.

VIENNA IMPERIAL POLYTECHNICUM. Prof. Dr. Joseph M. Eder. Elements of Photography and Photo-chemistry; Reproduction Methods.

VIENNA IMPERIAL INSTITUTE FOR PHOTOGRAPHIC PRACTICE, REPRODUCTION METHODS, AND MECHANICAL PRINTING. Prof. Dr. Joseph M. Eder, *Director*. Profs. Hans Lenhardt, Alex. Lainer, I. Hörwarter, C. Jasper, *Instructors*. Two Courses of Instruction. Drawing; Chemistry; Optics; Theories of Photographic Processes; Retouching Positives.

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Traité pratique du développement. Par Albert Londe. Gauthier-Villars et fils.

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UNITED STATES PATENTS.

SUITS for redress on account of infringement of patents are brought in the United States Circuit Court for the District where the defendant resides. Redress may be had through an injunction preventing further infringement and an accounting of the damages caused the patentee, or the profits, gains or advantages made by the infringer.

Until recently appeals from decisions rendered by the United States Circuit Court were necessarily taken to the Supreme Court of the United States, and, owing to the great amount of business done by the latter, a delay of at least four years was suffered by an appellee.

A new special Court, designated the Circuit Court of Appeals, has been provided. Appeals may hereafter be taken to this Court, and are likely to be reached and disposed of quite expeditiously. This is of particular advantage to patentees, in view of the fact that their monopolies run but a limited time.

Patents are issued in the name of the United States and under the seal of the Patent Office to any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned; and by any person who, by his own industry, genius, efforts, and expense, has invented and produced any new and original design for a manufacture, bust, statue, alto-relievo, or bas-relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics, any new and original impression, ornament, pattern, print, or picture to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known nor used by others before his invention or production thereof, nor patented nor described in any printed publication, upon payment of the fees required by law and other due proceedings had.

Joint inventors are entitled to a joint patent; neither can claim one separately. Independent inventors of distinct and independent improvements in the same machine can not obtain a joint patent for their separate inventions; nor does the fact that one furnishes the capital and another makes the invention entitle them to make application as joint inventors; but in such case they may become joint patentees.

Every patent contains a grant to the patentee, his heirs or assigns, for the term of seventeen years, of the exclusive right to make, use, and vend the invention or discovery throughout the United States and the Territories, referring to the specification for the particulars thereof.

If it appear that the inventor, at the time of making his application, believed himself to be the first inventor or discoverer, a patent will not be refused on account of the invention or discovery, or any part thereof, having been known or used in any foreign country before his invention or discovery thereof, if it had not been before patented or described in any printed publication.

Letters Patent granted a foreign government will not, while in force, prevent the inventor from obtaining a patent in the United States, unless the invention shall have been introduced into public use into the United States more than two years prior to the application. But every patent granted for an invention which is the subject of Letters Patent still in

force and previously granted to the same inventor in a foreign country will be so limited as to expire at the same time with such foreign patent, or, if there be more than one, at the same time with the one having the shortest unexpired term, but in no case will it be in force more than seventeen years.

Applications.

Application for a patent must be made in writing to the Commissioner of Patents. The applicant must also file in the Patent Office a written description of the same, and of the manner and process of making, constructing, compounding, and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which it appertains, or with which it is most nearly connected, to make, construct, compound and use the same; and in case of a machine, he must explain the principle thereof, and the best mode in which he has contemplated applying that principle, so as to distinguish it from other inventions, and particularly point out and distinctly claim the part, improvement, or combination which he claims as his invention or discovery. The specification and claim must be signed by the inventor and attested by two witnesses.

The applicant shall make oath that he verily believes himself to be the original and first inventor or discoverer of the art, machine, manufacture, composition, or improvement for which he solicits a patent; that he does not know and does not believe the same was ever before known or used, and shall state of what country he is a citizen. Such oath may be made before any person within the United States authorized by law to administer oaths, or, when the applicant resides in a foreign country, before any minister, charge d'affaires, consul, or commercial agent holding commission under the Government of the United States, or before any notary public of the foreign country in which the applicant may be.

When the nature of the case admits of drawings, the applicant must furnish one copy signed by the inventor or his attorney in fact, and attested by two witnesses, to be filed in the Patent Office. In all cases which admit of representation by model, the applicant, if required by the Commissioner, shall furnish a model of convenient size to exhibit advantageously the several parts of his invention or discovery.

On the filing of such application and the payment of the fee required by law, if, on such examination, it appears that the claimant is justly entitled to a patent under the law, and that the same is sufficiently useful and important, the Commissioner will issue a patent therefor.

Assignments.

Every patent or any interest therein shall be assignable in law by an instrument in writing; and the patentee, or his assigns or legal representatives may, in like manner, grant and convey an exclusive right under his patent to the whole or any specified part of the United States.

Reissues.

A reissue is granted to the original patentee, his legal representatives, or the assignees of the entire interest when, by reason of a defective or insufficient specification, or by reason of the patentee claiming as his invention or discovery more than he had a right to claim as new, the original patent is inoperative or invalid, provided the error has arisen from inadvertence, accident, or mistake, and without any fraudulent or deceptive intention. The applications must be made and the specification sworn to by the inventors, if they be living.

Caveats.

A caveat under the patent law is a notice given to the Office of the caveator's claim as inventor, in order to prevent the grant of a patent to another for the same alleged invention upon an application filed during the life of the caveat without notice to the caveator.

Any citizen of the United States who has made a new invention or discovery, and desires further time to mature the same, may, on payment of a fee of $10, file in the Patent Office a caveat setting forth the object and the distinguishing characteristics of the invention, and praying protection of his right until he shall have matured his invention. Such caveat shall be filed in the confidential archives of the Office and preserved in secrecy, and shall be operative for the term of one year from the filing thereof.

An alien has the same privilege, if he has resided in the United States one year next preceding the filing of his caveat, and has made oath of his intention to become a citizen.

The caveat must comprise a specification, oath, and, when the nature of the case admits of it, a drawing, and, like the application, must be limited to a single invention or improvement.

Fees.

Fees must be paid in advance, and are as follows: On filing each original application for a patent, $15. On issuing each original patent, $20. In design cases: For three years and six months, $10; for seven years, $15; for fourteen years, $30. On filing each caveat, $10. On every application for the reissue of a patent, $30. On filing each disclaimer, $10. For certified copies of patents and other papers, including certified printed copies, ten cents per hundred words. For recording every assignment, agreement, power of attorney, or other paper, of three hundred words or under, $1; of over three hundred and under one thousand words, $2; of over one thousand words, $3. For copies of drawings, the reasonable cost of making them.

COPYRIGHT LAW OF THE UNITED STATES.

1. A *printed* copy of the title of the book, map, chart, dramatic or musical composition, engraving, cut, print, photograph, or chromo, or a *description* of the painting, drawing, statue, statuary, or model or design for a work of the fine arts, for which copyright is desired, must be delivered to the Librarian of Congress or deposited in the mail, within the United States, *prepaid*, addressed

LIBRARIAN OF CONGRESS,

Washington, D. C.

This must be done on or before day of publication in this or any foreign country.

The *printed title* required may be a copy of the title page of such publications as have title pages. *In other cases the title must be printed expressly for copyright entry*, with name of claimant of copyright. The style of type is immaterial, and the print of a typewriter will be accepted. But a separate title is required for each entry, and *each* title must be printed on paper as large as commercial note. The title of a

periodical must include the date and number; and each number of the periodical requires a separate entry of copyright.

2. The legal fee for *recording* each copyright claim is 50 cents, and for a *copy* of this record (or certificate of copyright under seal of the office) an additional fee of 50 cents is required, making $1, if certificate is wanted, which will be mailed as soon as reached in the records. Publications which are the production of persons not citizens or residents of the United States, the fee for recording title is $1, and 50 cents additional for a copy of the record. Certificates covering more than one entry in one certificate are not issued.

3. Not later than the day of publication in this country or abroad, two complete copies of the best edition of each book or other article must be delivered, or deposited in the mail within the United States, addressed

LIBRARIAN OF CONGRESS,

WASHINGTON, D. C.,

to perfect the copyright.

The freight or postage must be prepaid, or the publications inclosed in parcels covered by printed Penalty Labels, furnished by the Librarian, in which case they will come FREE by mail (*not express*), without limit of weight, according to rulings of the Post Office Department. Books must be printed from type set or plates made in the United States; photographs from negatives made in the United States; chromos and lithographs from drawings on stone or transfers therefrom made in the United States.

Without the deposit of copies above required the copyright is void, and a penalty of $25 is incurred. No copy is required to be deposited elsewhere.

The law requires one copy of each new edition, wherein any substantial changes are made, to be deposited with the Librarian of Congress.

4. No copyright is valid unless notice is given by inserting in every copy published, on the title page or the page following, if it be a book; or if a map, chart, musical composition, print, cut, engraving, photograph, painting, drawing, chromo, statue, statuary, or model or design intended to be perfected as a work of the fine arts, by inscribing upon some portion thereof, or on the substance on which the same is mounted, the following words, viz.: "*Entered according to act of Congress, in the year* ———, *by* ———, *in the office of the Librarian of Congress, at Washington*," or at the option of the person entering the copyright, the words: "*Copyright, 18—, by* ———."

The law imposes a penalty of $100 upon any person who has not obtained copyright who shall insert the notice "*Entered according to act of Congress*," or "*Copyright*," etc., or words of the same import, in or upon any book or other article.

5. The copyright law secures to authors and their assigns the exclusive right to translate or to dramatize any of their works; no notice or record is required to enforce this right.

6. The original term of copyright runs for twenty-eight years. *Within six months before* the end of that time, the author or designer, or his widow or children, may secure a renewal for the further term of fourteen years, making forty-two years in all. Applications for renewal must be accompanied by a printed title and fee; and by explicit statement of ownership, in the case of the author, or of relationship, in the case of his heirs, and must state definitely the date and place of entry of the original copyright. Within two months of date of renewal the

record thereof must be advertised in an American newspaper for four weeks.

7. The time of publication is not limited by any law or regulation, but the courts have held that it should take place within a reasonable time. A copyright may be secured for a projected as well as for a completed work. But the law provides for no *caveat*, or notice of interference—only for actual entry of title.

8. Copyrights are assignable by any instrument of writing. Such assignment, to be valid, is to be recorded in the office of the Librarian of Congress within sixty days from execution. The fee for this record and certificate is one dollar, and for a certified copy of any record of assignment, one dollar.

9. A copy of the record (or duplicate certificate) of any copyright entry will be furnished under seal of the office, at the rate of fifty cents each.

10. In the case of books published in more than one volume, or of periodicals published in numbers, or of engravings, photographs, or other articles published with variations, a copyright must be entered for each volume or part of a book, or number of a periodical, or variety, as to style, title, or inscription, of any other article. To *complete* the copyright on a book published serially in a periodical, two copies of each serial part as well as of the complete work (if published separately), should be deposited.

11. To secure copyright for a painting, statue, or model or design intended to be perfected as a work of the fine arts, a definite title and description must accompany the application for copyright, and a mounted photograph of the same, as large as "cabinet size," mailed to the Librarian of Congress not later than the day of publication of the work or design.

The fine arts, for copyright purposes, include only painting and sculpture, and articles of merely ornamental and decorative art should be sent to the Patent Office, as subjects for Design Patents.

12. Copyrights cannot be granted upon Trade-Marks, nor upon names of companies, libraries, or articles, nor upon an idea or device, nor upon prints or labels intended to be used for any article of manufacture. If protection for such names or labels is desired, application must be made to the Patent Office, where they are registered, if admitted, at a fee of $6 for labels, and $25 for trade-marks.

13. The provisions as to copyright entry in the United States by foreign authors, etc., by act of Congress approved March 3, 1891 (which took effect July 1, 1891), are the same as the foregoing, except as to productions of persons, not citizens or residents, which must cover return postages, and are $1 for entry, or $1.50 for entry and certificate of entry (equivalent to 4*s.* 5*d.* or 6*s.* 7*d.*). All publications must be delivered to the Librarian at Washington free of charge. The free penalty labels cannot be used outside of the United States.

The right of citizens or subjects of a foreign nation to copyright in the United States extends by Presidential proclamations of July 1, 1891, April 15, and October 31, 1892, to Great Britain, France, Belgium, Switzerland, Germany, and Italy.

14. Every applicant for a copyright should state distinctly the full name and residence of the claimant, and whether the right is claimed as author, designer, or proprietor. No affidavit or witness to the application is required.

RECORD OF PHOTOGRAPHIC PATENTS

Issued by the United States Patent Office from September 1, 1893, to August 31, 1894, Inclusive, with the Names of Patentees.

Compiled by F. C. Beach.

504,425.—Camera Shutter.
Oscar J. Schramm, Minneapolis, Minn.

504,578.—Flash-Light Apparatus for Photographers' Use.
Joseph N. Harrison and Henry J. Harrison, San Francisco, Cal.

504,597.—Holder for Plates in the Manufacture of Photo-Engravings.
Max Levy, Philadelphia, Pa.

504,835.—Paper for Making Transfer Pictures.
H. D. Grousilliers, Berlin, Germany.

504,955.—Combined Charger, Reflector and Smoke Arrester for Flash Light Burners.
S. M. Williams, San Francisco, Cal.

504,956.—Flash Light Burner.
S. M. Williams, San Francisco, Cal.

505,014.—Flash Light Burner.
S. M. Williams, San Francisco, Cal.

505,111.—Photographic Printing Frame.
G. W. Low and W. Shakespeare, Jr., Kalamazoo, Mich.

505,127.—Mirror for Use in Photography.
H. P. Ranger, Rochester, N. Y.

505,149.—Telescope Stand for Mathematical and Optical Instruments.
M. Weyl, Berlin, Germany.

505,331.—Negative and Screen-Holder.
James Scouler, San Francisco, Cal.

505,618.—Glue for Cardboard and Photographs.
Herman W. Vogel, Charlottenburg, Berlin, Germany.

505,813.—Camera.
Edgar R. Bullard, Wheeling, W. Va.

505,872.—Frame for Pictures or Cards.
Henry Bierderman, New York.

505,968.—Photographic Background.
James H. Titus, Tarentum, Pa.

506,025.—Photographic Posing Chair.
John Winter, Sr., Syracuse, N. Y.

506,109.—Half-Tone Negatives for Photo Processes.
Fredrick J. M. Gerland, Bayonne, Jersey City, N. J.

506,210.—Roll Holder Camera.
Robert J. de Barrill, New York.

506,343.—Photographer's Changing and Developing Box.
James F. Snapp, Garza, Texas.

506,893.—Rack for Displaying Photographs.
Thomas E. Wood, Kalamazoo, Mich.

507,529.—Picture Exhibitor.
RASMUS K. DOE, Duluth, Minn.

507,785.—Apparatus for Automatically Displaying Pictures.
GEORGE COOK, London, England, and CHARLES K. MARR, Glasgow, Scotland.

507,790.—Camera Shutter.
ERSKINE DECKER, Cassopolis, Mich.

507,805.—Camera Stand.
JOHN H. GREEN, Ishpeming, Mich.

508,204.—Photographic Plate Holder.
EDGAR B. BULLARD, Wheeling, W. Va.

508,319.—Tripod Head.
JOHN F. IVARSON, Boston, Mass.

509,120.—Process of Making Relief Plates.
J. F. EARHART, Cincinnati, Ohio.

509,611.—Magazine Camera.
LOUIS CHRONIK, of Brooklyn, and AUGUST CHRONIK, of New York.

509,698.—Panoramic Camera.
RICHARD W. STEWART, Devonport, England.

509,721.—Photographic Retoucher.
JAMES R. DAKE, Medford, Wis.

509,841.—Photographic Camera.
HERRMAN CASSLER, Syracuse, N. Y.

510,371.—Photographic Printing Machine.
C. VAN BUSKIRK, Boston, Mass.

510,758.—Method of Photogrammetry.
CORNELL B. ADAMS, Augusta, Ga.

510,759.—Aerial Camera.
CORNELL B. ADAMS, Augusta, Ga.

510,805.—Photographic Camera Shutter.
WILLIAM B. LEWIS, Huntington, N. Y.

511,043.—Camera Stand for Bicycles.
CHARLIE H. CAMPBELL, Ocala, Florida.

511,133.—Photographic Camera.
JOHN FRETWELL, Providence, R. I.

512,333.—Background Carriers for Photographers.
M. M. SIMMER, Henderson, Minn.

512,512.—Panoramic Roll-Holder Camera.
PERCY S. MARCELLUS, Philadelphia, Pa.

512,601.—Camera Shutter.
HARVEY R. CARLOTON, Rochester, N. Y.

512,655.—Photographic Camera Shutter.
WILLIAM H. LEWIS, Huntington, N. Y.

512,671.—Photographic Camera Shutter.
CHARLES W. EDDY, Ware, Mass.

512,914.—Photographic Plate-Holder.
CHARLES C. SPALSBURY, East Orange, N. J.

513,058.—Combined Cane and Camera Tripod.
BESSIE RAHMER, New York, N. Y.

513,149.—Combined Photographers' Bath and Printing Frame.
FRASER SANDEMAN, London, Eng.

513,517.—Photographic Printing Frame.
CHARLES E. LEWIS, Alma, Mich.

514,603.—Photographic Embossing Press.
DAVID MCKEE, Anderson, Ind.

514,707.—Magic Lantern.
G. E. and V. H. EMERSON, Newark, N. J.

515,080.—Photographic Vignetter.
HEMMING L. HULTGREN, Chicago, Ill.

515,230.—Photographic Camera Shutter.
SETH C. JONES, Rochester, N. Y.

516,076.—Coin Controlled Photographic Apparatus.
JAMES W. BURTON, Cleveland, Ohio.

516,278.—Apparatus for Photographically Recording Time, Position and Speed.
WILLIAM G. PETRI, Wichita, Kansas.

516,861.—Means for Regulating Rays of Light passing through Photographic Lenses.
JAMES W. FAWCETT, St. Kilda, Victoria.

517,119.—Photographic Background Holder.
CHARLEY O. JOHNSON, Sioux City, Ia.

517,164.—Photographic Camera Shutter.
WILLIAM L. LIGHTFORD, Indianapolis, Ind.

517,360.—Tripod or Support for Cameras.
ENOCH W. PERRY, JR., New York.

517,364.—Skylight for Photographic Galleries.
WILLIAM SHAW, HENRY SHAW and JOSEPH SHAW, Jacksonville, Fla.

517,444.—Support for Cards, Pictures or Like Articles.
S. DALSHEIMER and A. GREENLEAF, Baltimore, Md.

517,539.—Camera.
HERRMAN CASSLER, Syracuse, N. Y.

517,733.—Photographic Camera. Multiplying Attachment.
DAVID S. COLE, Washington, Ia.

517,870.—Lime Light Apparatus.
W. LAWSON, Newton-le-Willows, England.

518,073.—Stand for Photographs.
ARTHUR D. F. RANDOLPH, New York.

518,074.—Photographic Dark Box.
ARTHUR D. F. RANDOLPH, New York.

518,075.—Photographic Developing Tray.
ARTHUR D. F. RANDOLPH, New York.

518,104.—Stereopticon.
E. HUDSON, Washington, D. C.

518,346.—Photographic Album.
J. EKVAL, Fargo, N. D.

518,372.—Registering and Marking Apparatus for Photographic Filmholders.
HERRMANN MACKENSTEIN, Paris, France.

518,802.—Roll Holder Camera.
ERASTUS B. BARKER, Newark, N. J.

518,929.—Photographic Printing Frame.
RUDOLPH M. HUNTER, Philadelphia, Pa.

519,247.—Camera Shutter.
LEO F. EIDEN, East Warren, Pa.

519,276.—Magazine Plate-holder.
AUGUST STEGEMANN, Berlin, Germany.

519,645.—Photographic Plate.
T. C. ROCHE, Brooklyn, N. Y.

519,646.—Photographic Plate.
T. C. ROCHE, Brooklyn, N. Y.

519,800.—Photographic Vignetter.
JOHN B. WALKER, Kansas City, Kansas.

519,872.—Coin-Controlled Photographic Apparatus.
J. A. PARSONS, Rocky River, Ohio.

520,034.—Photographic Camera. Multiplying Attachment.
DAVID S. COLE, Washington, Ia.

520,058.—Lamp Sketching Camera.
CHANCEY R. JENNE, Fort Wayne, Ind.

520,198.—Photographic Shutter.
HENRY H. TURNER, Rochester, N. Y.

520,290.—Photographic Plate-holder.
ERASTUS R. BARKER, New York.

520,696.—Camera Shutter.
WILLIAM J. MCCOLLOM, Swededale, Ia.

520,707.—Art of Reproducing Objects in Relief or Intaglio by the Aid of Photography.
MARIO RUSSO, Rome, Italy.

520,950.—Camera.
THEODORE M. CLARKE, Newton, Mass.

520,953.—Picture Exhibitor.
J. E. ECKLUND, Rockford, Ill.

520,972.—Photographic Camera Shutter.
ABNER T. TISDELL, Brooklyn, N. Y.

521,064.—Method of and Lens for Making Photographs.
HENRY V. D. WEYDE, London, Eng.

521,362.—Electric Arc Light for Magic Lantern.
CHARLES BESELER, Jersey City, N. J.

521,563.—Roll Holding Camera.
A. DELUG, Stuttgart, Germany.

521,569.—Photographic Album.
G. KOLL, Newark, N. J.

521,659.—Screen for Half-Tone Process.
M. LEVY, Philadelphia, Pa.

521,668.—Photograph Display Cabinet.
H. W. POTTEIGER and W. A. KOHMAN, Reading, Pa.

521,705.—Process for Producing Positive Phonoscopic Plates.
G. DEMENY, Paris, France.

522,372.—Apparatus for Retouching Negatives.
CURTIS HORNBERGER, Harrisonville, Mo.

522,921.—Magazine Photographic Camera.
GEORGE PERCIVAL SPOONER, Bron-y-Garth, Eng.

523,323.—Photography by Artificial Light.
BARNETT M. CLINEDINST, Washington, D. C.

523,336.—Panoramic Camera.
FRANK F. DUMKE, Milwaukee, Wis.

524,142.—Photographic Camera.
JOHN C. HEGELEIN, New York.

524,143.—Camera Shutter.
JOHN C. HEGELEIN, New York.

524,301.—Lantern Slide Mat.
P. S. BENEDICT, New Orleans, La.

524,670.—Iris Diaphragm Shutter.
P. RUDOLPH and O. NATHER, Jena, Germany.

524,726.—Device for Cutting Cards With Beveled Edges for Photograph Mounts.
B. MCHUGH, Ottawa, Canada.

524,802.—Magazine Camera.
A. A. FOIRET, Nice, France.

524,949.—Magazine Camera.
J. F. PARSONS, Bristol, England.

525,238.—Photographic Camera.
J. TASCHER, Chicago, Ill.

525,239.—Magazine Camera.
J. TASCHER, Chicago, Ill.

DESIGN PATENTS.

23,518.—Photographic Card Mount.
J. P. ODGERS, Philadelphia, Pa.

TRADE MARKS.

24,910.—Paper for Photographic Use.
VEREINIGTE FABRIKEN PHOTOGRAPHISCHER PAPIERE, Dresden, Germany.

25,117.—Paper.
E. & H. T. ANTHONY & CO., New York, N. Y.

25,118.—Paper.
E. & H. T. ANTHONY & CO., New York, N. Y.

RATES OF DOMESTIC POSTAGE

TO ANY PART OF THE UNITED STATES, CANADA, OR MEXICO.

SEE NOTE H.

	cts.	oz.	See Spec'l Note.
Address Tags	1	1	*a*
Bill Heads	1	1	*a*
Blotters (printed)	1	1	*a*
Blue Prints	1	2	*d*
Books, printed	1	2	*d*
Cards, playing	1	1	*a*
" printed			
" business			
" Christmas, etc.‡	1	2	*a*
" Easter‡			
" New Year‡			
Chromos‡	1	2	*a*
Catalogues	1	2	*d*
Circulars	1	2	*d*
Coins	1	1	*a b*
Copy (MSS.)	2	1	*e*
" (with proof sheets)	1	2	*e*
Crayon	1	1	
Desk Blotters	1	1	*a*
Drawings / Designs } Pen or Pencil	1	1	* *e*
Easter Cards‡	1	2	*a*
Engravings	1	2	*a*
Handbills	1	2	*a*
Letters	2	1	*e*
Labels (printed)	1	2	*a*
Lithographs	1	2	*a*
Manifold Letters	2	1	*e*
Manuscript	2	1	*e*
Magazines	1	4	*d*
Merchandise	1	1	*a b*
Maps (printed)	1	2	*e*
Newspapers	1	4	*d*
New Year Cards‡	1	2	
Packages, sealed	2	1	*b*

	cts.	oz.	See Spec'l Note.
Packages, unsealed	1	1	† *b*
Pamphlets	1	2	*d*
Patterns (cut)	1	1	*a*
Periodicals	1	4	*d*
PHOTOGRAPHS	1	2	*d*
Pictures (scrap)	1	2	
Playing Cards	1	1	*a*
Postal Cards	1	ea.	*f*
Printed Matter (*not merchandise or samples*)	1	2	*d*
Printed Envelopes	1	1	*a*
Prospectuses	1	2	*d*
Proof Sheets	1	2	*d g*
Plans (in writing)	2	1	*e*
Registration	8	ea.	*i*
Samples	1	1	*b*
Sample copies of regular publications mailed by publisher (second-class)	1	lb.	
Sample copies of regular publications not mailed by publisher	1	4	*a*
Scrap Pictures	1	2	*a*
Seeds, Plants, etc.	1	2	
Specie	1	1	*a b*
Stereoscopic Views	1	2	*d*
Tickets	1	2	*a*
Type Writer Work	2	1	*e*
Valentines (if printed without embellishment with silk, satin, etc.)	1	2	*a*
Visiting Cards (printed)	1	2	*a*

* If pen or pencil drawings contain no written letters, figures, or words, they are fourth class matter, otherwise first class.

† May be either third or fourth class.

‡ Third-class matter if printed on paper; if on silk, cotton, satin, canvas, or other material than paper or paper board, fourth class matter.

GENERAL NOTES.

Cards, circulars, catalogues, etc., relating to the business of one or more firms, and different articles of all kinds and classes, may be placed in the same package, provided that the highest rate of postage that any part of the contents is subject to shall be prepaid on the whole package.

The following articles are unmailable, and will not be dispatched in any case :—Spirituous, malt, or vinous liquids, poisons, explosive matter, inflammable articles, live or dead animals, insects (except queen bees when safely secured), substances exhaling a bad odor, fresh fruits and vegetables, obscene or indecent books, prints, writings, or papers; all postal cards or letters on the envelopes of which lewd, obscene, or lascivious deliniations, offensive duns, epithets, terms, or language are written or printed, all matter concerning lotteries or schemes devised and intended to defraud the public, or for the purpose of obtaining money under false pretences, and all mail matter not addressed to a post-office or to no particular person, firm, company, or publication.

Special Delivery.—Any mail matter, when bearing, in addition to the regular postage, a "special delivery" stamp (face value, ten cents), will be immediately delivered by special messenger on its arrival at destination, between the hours of 7 A.M. and 7 P.M., and within one mile from the post-office, if it be not a letter-carrier office. At letter-carrier offices special delivery is obligatory within the carrier limits, and between the hours of 7 A.M. and 11 P.M.

Note A.

Fourth Class Matter—Samples and Merchandise.—Weight limited to 4 pounds. Postage must be fully prepaid. The rate is *one cent an ounce or fraction thereof.* Merchandise may have printing on it or on the wrapper. Written marks, in addition to the address, are allowed on Fourth Class matter, as follows:—The name and address of sender preceded by the word "From"; and any names, numbers, marks, or letters for the purpose of description. A request to the delivering Postmaster may also be written asking him to notify sender if the package is not delivered; also an ordinary request to return to the sender in case of non-delivery.

Note B.

Articles of the Fourth Class liable to injure or deface the mails, such as glass, needles, nails, pens, etc., must first be placed in a bag, box or open envelope, which must then be inclosed in another outside tube or box made of metal or hardwood, without sharp corners or edges and having a sliding clasp or screw lid, thus securing the articles in a double package; if the articles are fragile, they must be packed with sawdust, cotton or other packing material in the inside pocket. Powdered articles, such as flour, sugar, etc., may be inclosed in a transparent bag or envelope, and must be securely packed so as to prevent breaking. Admissible liquids and oils (not exceeding 4 ounces liquid measure), pastes, salves or articles easily liquefiable, must conform to the following conditions: When in glass bottles or vials, such bottles or vials must be strong enough to stand the shock of handling in the mails, and must be inclosed in a wooden or papier-mache block or tube *not less than three-sixteenths of an inch thick* in the thinnest part, strong enough to support the weight of mails piled in bags and resist rough handling; and there must be pro-

vided, between the bottle and its wooden case, a cushion of cork crumbs, cotton, felt, asbestos, or some other absorbent, sufficient to protect the glass from shock in handling; the block or tube impervious to liquids, including oils, etc., to be closed by a tightly fitting screw-lid of wood or metal, with a rubber or other pad so adjusted as to make the block or tube water-tight and to prevent the leakage of the contents in case of breaking of the glass. When inclosed in a tin cylinder, metal case or tube, such cylinder, case or tube should have a screw-lid with a rubber or cork cushion inside in order to make the same water-tight, and should be securely fastened in a wooden or papier-mache block (open only at one end), and not less in thickness and strength than above prescribed. Manufacturers or dealers intending to transmit articles or samples in considerable quantities, should submit a sample package, showing their mode of packing, to the Postmaster at the mailing office, who will see that the conditions of this section are carefully observed.

Note D.

Third Class Matter—Prepayment.—Postage must be fully prepaid, otherwise the matter will be "held for postage." The rate is *one cent for every two ounces or fraction thereof. The limit of weight is* 4 pounds, except on single books. Writing.—No writing is permitted on Third Class matter, except as follows: The name and address of the sender on the outside or inside of package, preceded by the word "From," and any printing not in the nature of personal correspondence. The sender is further allowed to mark a word or passage in a book or paper to which he desires to call special attention. He may also write a simple inscription or dedication upon the cover or blank leaf of a book or pamphlet. The date, address and signature of a circular may be written. Any other writing on Third Class matter will subject the package to letter rates of postage, and may render the sender liable to a fine of ten dollars. *Photographs* and *blue prints* must bear no other writing than the name of the sender.

Wrapping —Mail matter of the Third Class must be so wrapped or inclosed that it can be readily examined without destroying the wrapper; otherwise it will be subject to postage at the First Class rate (two cents per ounce), as will all articles inclosed in sealed envelopes with clipped ends, sides or corners, or in boxes with covers secured by nails, and all packages the wrappers of which are secured to the inclosure by postage stamps.

Note E.

First Class.—This class includes letters, postal cards, sealed packages, all matter wholly or partly in writing (whether manuscript or produced by type-writer or copying press), drawings, designs, plans and maps, if they contain descriptive words, letters or figures in writing, produced by hand, manuscript for publication not accompanied by proof-sheets, and all personal correspondence, whether in writing or in print. (See under heads "Third Class," "Fourth Class," notes "A" and "D," certain writing permitted in or on articles of those classes.)

The rate of postage on mail matter of the First Class (sealed or unsealed) is *two cents for each ounce or fraction thereof*, excepting postal cards, and excepting also letters for *local delivery* posted at the post-offices where no letter-carriers are employed, in which case the rate is *one cent per ounce or fraction thereof.*

The law provides that the postage on all mail matter of the First Class shall be prepaid only by postage stamps or by inclosure in government

stamped envelopes, and that any article of this class (not entitled by law to free transmission in the mails) deposited in a post-office wholly unpaid or prepaid *less than one full rate, cannot be forwarded or delivered*, but must be "held for postage." LIMIT OF WEIGHT.—There is no limit to the weight of letters or packages of First Class matter. WRAPPING OR ENCLOSURE.—Mail matter of the First Class may be wrapped or enclosed in any manner that the sender may desire. RETURN.—Letters not delivered will be returned to writer free, if a request to that effect is placed on the envelope. FORWARDING.—A letter will be forwarded by the Postmaster who may hold it, to another post-office, at the request of the person to whom the letter is addressed. Letters addressed to the care of another person, or erroneously delivered, may be redirected and returned within a reasonable time to post-office, and will be forwarded without additional charge.

The putting on of requests to return the matter to the sender in case of non-delivery is recommended by the Post-Office Department—not on first-class alone, but on all matter.

Note F.

POSTAL CARDS.—No cards are "Postal Cards" except those issued by authority of the Postmaster-General (the imitation of which is forbidden and punished by law); and so-called "Postal Cards" issued by private parties are subject to letter rates of postage when they contain any written matter whatever in addition to the date, and the name of the addressee and of the sender, and the correction of mere typographical errors herein. Nothing whatever may be attached to a Postal Card except an address label, which may be pasted to the *address side*, and no printing or writing is permitted upon the address side of Postal Cards, except that imprinted thereon at the manufactory and such as may be necessary for the proper direction of the same. Postal Cards are unmailable as such when incomplete or mutilated, and in all cases where any of the above conditions are not complied with. Undelivered single Postal Cards are not returned to senders.

Note G.

PROOF SHEETS may be corrected or uncorrected, with or without the original manuscript, additions to or alterations in the matter, or directions as to the typographical part of the work; but directions in writing as to binding, quality of paper, etc., are not permissible unless the letter rate of postage be paid.

Note H.

CANADA AND MEXICO.—Matter mailed in the United States, addressed to Mexico, is subject to the same postage rates and conditions as it would be if it were addressed for delivery in the United States, except that articles of miscellaneous merchandise (fourth-class matter) not sent as *bona-fide* trade samples, are required to be sent by "Parcels Post," and that the following articles are *absolutely excluded* from the mails without regard to the amount of postage prepaid, or the manner in which they are wrapped, viz.:

All sealed packages, other than letters in their usual and ordinary form; *all* packages (including packages of second-class matter, which weigh more than 4 pounds 6 ounces), except such as are sent by "Parcels Post;" liquids, pastes, confections and fatty substances; publications which violate any copyright law in Mexico.

Single volumes of printed books in *unsealed* packages, are transmissible to Mexico in the regular mails without limit as to weight.

"*Commercial Papers*," and *bona-fide* trade samples are transmissible to Mexico in the regular mails at the postage rate given above, opposite "Commercial Papers" and "Samples of Merchandise," respectively. See also Note 14, pp. 925 and 927 of the *United States Official Postal Guide* for January, 1894.

Matter mailed in the United States, addressed to Canada, is subject to the same postage rates and conditions as it would be if it were addressed for delivery in the United States, except that "Commercial Papers" are transmissible at the postage rate given above opposite "Commercial Papers"; that packages of seed, plants, etc., are subject to the postage rate of one cent per ounce, and that the following articles are *absolutely excluded* from the mails, without regard to the amount of postage prepaid, or the manner in which they are wrapped, viz.:

All sealed packages, other than letters in their usual and ordinary form; *all* packages (except single volumes of printed books and packages of second-class matter), which weigh more than 4 pounds 6 ounces; Police Gazettes; publications which violate any copyright law of Canada.

United States Postal Agency at Shanghai, China.—Articles addressed for delivery at the following places in China, viz.: Cheefoo (or Yenti), Chin Kiang, Chung King, Kaiping, Kalgan, Kiukiang, Nanking, Newchwang, Ningpo, Ourga, Peking, Hang Chow, Hankow, Ichang, Shanghai, Taku, Tientsin, Wenchow, Wuchang, Wuhu, are transmissible in the mails made up in San Francisco for the United States Postal Agency at Shanghai. See "Shanghai" in the Foreign Postage Table on page 20.

Note 1.

Registration.—All kinds of mail matter can he registered at the rate of eight cents for each package, in addition to the postage at regular rates, both postage and fee to be fully prepaid by stamps; all conditions as to marks, contents and method of securing packages being the same as described under the various classes (Notes A, D, E). Each package must bear name and address of sender, and a receipt will be returned from the person to whom addressed.

Domestic Money Orders.

For Orders not exceeding						$0 03
"	exceeding	$2.50	and not exceeding		$5.00...	05
"	"	5.00	"	"	10.00...	08
"	"	10.00	"	"	20.00...	10
"	"	20.00	"	"	30.00...	12
"	"	30.00	"	"	40.00...	15
"	"	40.00	"	"	50.00...	18
"	"	50.00	"	"	60.00...	20
"	"	60.00	"	"	75.00...	25
"	"	75.00	"	"	100.00...	30

(Postal Notes no longer issued.)

INTERNATIONAL MONEY ORDERS.

The fees for International Money Orders are as follows:

For sums not exceeding $10	$0 10	Over $50 and not exceeding $60	$0 60
Over $10 and not exceeding $20	20	" 60 " " 70	70
" 20 " " 30	30	" 70 " " 80	80
" 30 " " 40	40	" 80 " " 90	90
" 40 " " 50	50	" 90 " " 100	1 00

The sender of a money order must state the particulars thereof upon a form furnished by the post-office.

A money order may be endorsed once only.

The person who presents a money order for payment must be identified if unknown to the postmaster, unless the remitter upon his application waives identification.

A domestic money order may be repaid within a year at the office of issue. The fee will not be refunded.

Duplicates of lost or invalid money orders are issued by the department free of charge upon application made through the issuing or paying postmaster by remitter, payee or indorsee.

The issue of money orders on credit is prohibited.

A money order may be paid to a second person by endorsement of payee, or upon a written order or power of attorney to be filed with the paying postmaster.

A duplicate cannot be obtained of a postal note lost or destroyed.

An invalid postal note, that is, one not paid within three months from the last day of month of issue, will be replaced at an extra charge of three cents, by a duplicate issued by the department, to be applied for through the postmaster at any money order office. The invalid note must accompany the application.

International money orders may be drawn for payment in the following countries and places:

Order Should be Sent by Remitter to Payee.

Alexandria, Egypt, if drawn as a French order.
Algeria.
Amoy, China.
Bahama Islands.
Bermudas.
Beyroot, Turkey, if drawn as a French order.
British Bechuanaland, South Africa.
British Guiana.
Canada.
Canton, China.
Cape Colony, South Africa.
Constantinople, Turkey, if drawn as British or French.
Foochow, China.
France.
Great Britain and Ireland.
Hankow, China
Hawaiian Islands.
Hoihow, China.
Hong Kong, China.
Jamaica.
Leeward Islands.
Newfoundland.
New South Wales.
New Zealand.
Ningpo, China.
Orange Free State, South Africa.
Panama.
Port Said, Egypt.
Queensland.
Salonica, Turkey, if drawn as a French order.
Shanghai, China.
Smyrna, Turkey, if drawn as a French order.
South Australia.
Swatow, China.
Tasmania
Transvaal, South Africa.
Tripoli, Africa.
Tobago, West Indies
Tunis, Africa.
Trinidad, West Indies.
Victoria, Australia.
Windward Islands.
Zanzibar, Africa, if drawn as a French order.

Order May be Kept by Remitter as a Receipt.

Accra, Gold Coast, Africa.
Aden, Arabia.
Adrianople, Turkey.
Alexandria, Egypt, if drawn as a British order.
Archipelago of Banca, Dutch East Indies.
Archipelago of Billiton, Dutch East Indies.
Archipelago of Riouw, Dutch East Indies.
Assab, Africa.
Austria-Hungary.
Azores.
Bagdad, Turkey.
Banana, Congo Free State.
Bassorah, or Basra, Turkey.
Bathurst, Gambia, Africa.
Belgium.
Belize, British Honduras.
Beluchistan, Asia.
Bermuda.
Beyroot, Turkey, if drawn as British or Austrian.
Boma, Congo Free State.
Borneo.
Bosnia.
British Honduras.
Bulgaria.
Bunder Abbas or Gombroon, Persia.
Burmah, Asia.
Busbire, or Abu'-Shehr, Persia.
Caipha (or Haifa), Turkey.
Cameroons, Cameroons, Africa.
Candia, Crete, Turkey.
Canea, Crete, Turkey.
Cape Coast Castle, Gold Coast, Africa.
Celebes.
Ceylon.
Constantinople, Turkey, if drawn as Austrian.
Cyprus.
Danish West Indies.
Dar es Salaam, Africa.
Denmark.
Durazzo, Turkey.
Egypt.
Falkland Islands.
Faroe Islands.
Gambia, Africa.
Germany.
Gibraltar.
Gold Coast Colony, Africa.
Guadur or Gwadel, Beluchistan.
Heligoland.
Herzegovina.
Iceland.
India, British.
Italy.
Jaffa, Turkey.
Japan.
Java.
Jask, Persia.
Jerusalem, Turkey.
Kerassunde, Turkey.
Kilwa, Africa.
Klein-Popo, or Little Popo, Togo, Africa.
Lagos, Africa.
Labuan, Borneo.
Lamu, Africa.
Lindi, East Africa.
Linga, or Lingor, Persia.
Little Popo, or Klein-Popo, Togo, Africa.
Lome, Togo, Africa.
Luxemburg, Grand Duchy.
Madeira Islands.
Madura, Dutch East Indies.
Malacca, Straits Settlements.
Malta.
Massowah, Africa
Matadi, Congo Free State
Mauritius.
Mitylene, Turkey.
Molucca Islands.
Mombasa, Africa.
Muscat, Arabia.
Natal, South Africa.
Netherlands.
North Borneo, Sandakan.
Norway.
Pangani, Africa.
Penang, Straits Settlements.
Portugal.
Previsa, Turkey.
Retimo, Crete.
Rhodes, Turkey.
Roumania.
Saadani, East Africa.
Saint Helena.
Salonica Turkey, if drawn as British or Austrian.
Salt Pond, Gold Coast.
Salvador, Central America.
Samsun, Turkey.
Sandakan, Borneo.
Sant Quaranta, Turkey.
Sarawak, Borneo.
Scio, Chios, Turkey.
Seychelle Islands.
Sierra Leone, Africa.
Singapore, Straits Settlements.
Smyrna, Turkey, if drawn as Austrian.
Straits Settlements.
Sweden.
Switzerland.
Tanga, Africa.
Tangier, Morocco.
Trebizond, Turkey.
Turk's Island, West Indies.
Valona, Turkey.
Victoria, Cameroons, Africa.
Western Australia.
Zanzibar, Africa, if drawn as a British order.

RATES OF POSTAGE TO FOREIGN COUNTRIES.

UNIVERSAL POSTAL UNION.

Treaty concluded at Vienna, Austria, July 4, 1891.

	Cts.
Letters, per 15 grams or ½ ounce (prepayment optional, except to places marked *).	5
Postal Cards, each	2
Postal Cards, with paid reply, each	4
Commercial papers, First 10 ounces or fraction thereof	5
Commercial papers, Every additional 2 ounces	1
Samples of merchandise, First 4 ounces	2
Samples of merchandise, Every additional 2 ounces	1
Registration Fee on letters or other articles	8

All correspondence other than letters must be prepaid at least partially.

†Correspondence paid to British Indian Frontier only.

INTERNATIONAL MONEY ORDERS are issued only to Countries or Places marked ¶.

COUNTRIES OR PLACES WHICH, WITH THE UNITED STATES, ARE COMPRISED IN THE UNIVERSAL POSTAL UNION, AND TO WHICH THE ABOVE RATES APPLY.

(The Italics in brackets represent the Nationality of Foreign Possessions.)

Abyssinia, East Africa.
Aden, Arabia, British P. O.
Africa (W. C.) Br. Colonies.
Africa (Fr. Port. & Sp. pos.)
Ajuda, Africa. (*Portuguese*)
Algeria, Africa. (*French.*)
Algiers, Africa. (*French.*)¶
Alhucemas, N. Africa. (*Sp.*)
Amar, Asia. (*Spanish.*)
Amirante Islands, E. Africa.
Amoy, Hong Kong P. O.
Andorra, Rep. of (*Spain.*)
Angola, Africa. (*Portug'se.*)
Annobon Isl'd., Africa. (*Sp.*)
Antigua, Isl'd. W.I. (*British*)
Aracan, British India.
Argentine Republic.
Aruba, S. America. (*Dutch.*)
Asia (Dch.; Fr., Pr. & Sp. Col.)
Colon, U. S. of Colombia.
Assinie, Africa. (*French.*)
Austria-Hungary.¶
Azores Islands. (*Port.*)¶
Bahama Islands. (*British.*)
Bakel, Africa. (*French.*)
Balearic Isles. (*Spanish.*)
Bali, Asia. (*Dutch.*)
Banca, Asia. (*Dutch.*)
Barbadoes, W. I. (*British.*)¶
Barbary (Tunis & Tripoli.)
Batavia, Java, Asia. (*Dutch.*)
Bay Islands, Sp. Honduras.
Belgium.¶
Bermuda Islds., W. I. (*Br.*)
Bien-Hoa, Coch.-China. (*Fr*)
Billiton, Asia. (*Dutch.*)
Bissao, Africa. (*Portug'se.*)
Bogota, U.S. of Colombia.
Bolivia, South America.
Bonaire Islds., W.I. (*Dutch.*)
Borneo, Asia. (*Dutch.*)
Bourbon, Isld., Africa. (*Fr.*)
Brazil, South America.
Bulgaria, Principality of.
Burmah, British India.
Cabul, Afghan, *via* Italy.*†
Cacheo, Isld., Africa. (*Port*)
Cambodia, Fr. P. Offices in.
Cameroons (or Kameroun), West Africa.
Canary Islands. (*Spanish.*)
Canton, Hong Kong, P. O.
Cape Verde Is., Afr. (*Port.*)
Caroline Is., Oceanica. (*Sp.*)
Carthagena, U. S. Colombia.
Casablanca, Morocco. (*Sp.*)
Celebes, Asia. (*Dutch.*)
Ceuta, N. Africa. (*Spanish.*)
Ceylon. (*British.*)
Chaffarine Is., N. Afr. (*Sp.*)
Chandernagore, India. (*Fr.*)
Chili, South America.
China, *via* Russia.
China, *via* Hong Kong.
China, *via* France.
Cochin China (French Col.in)
Colombia (U.S. of) S. Amer.
Comino, Malta. (*British.*)
Cominotto, Malta. (*British.*)
Congo (State of) W. Africa.
Constantinople, Turkey.¶
Corisco Is., Africa. (*Sp.*)
Costa Rica, Cent'l America.
Cuba, W. I. (*Spanish.*)
Curacoa Is., W.I. (*Dutch.*)
Cyprus Island. (*British.*)
Dagana, Senegal. (*French.*)
Damao, Asia. (*Portuguese.*)
Denmark.¶
Desirade Isld., W. I. (*Fr.*)
Diu, Asia. (*Portuguese.*)
Dominica Isld., W. I. (*Brit.*)
Dominica, Rep. of, W. I.
East Africa, Ger. Protectorate.
Ecuador, S. America.
Egypt, Africa.¶
Falkland Is., S. Amer. (*Br.*)
Faroe Islands, Denmark.
Fernando Po. Is., Afr., (*Sp.*)
Finland, Gr. Duchy, Russia.
Flores, Asia. (*Dutch.*)
Foo-chow, Hong Kong P. O.
Formosa, *via* Hong Kong.
France.¶
French Colonies, all.
Fusam-po, Corea, Jap. P.O.
Gaboon, Senegal. (*French.*)
Gambia, W. Africa. (*Br.*)
Gambier, Is., Oceanica. (*Fr.*)
Genzanshin, (Corea.) Japanese P. O. at.
Germany.¶
Gibraltar, Spain. (*British.*)
Goa, Asia. (*Portuguese.*)
Gold Coast, W. Africa. (*Br.*)
Goree, Senegal. (*French.*)
Gozzo, Malta. (*British.*)
Grand Bassam, W. Afr. (*Fr.*)
Great Britain.¶
Greece.
Greenland, N. America.
Grenada, Isld., W. I. (*Br.*)¶
Grenadines Is., W. I. (*Br.*)
Guadeloupe Is., W. I. (*Fr.*)
Guadur, British India.
Guatemala, Centr. America.
Guiana, Br., Fr. and Dutch.
Hankow, Hong Kong P. O.
Hawaii, Sandwich Islands.¶
Hayti, Isld., W. I.
Hatien, Cochin China. (*Fr.*)
Heligoland Isld., Germany.
Hindostan, British India.
Hoihow, Hong Kong P. O.
Holkar, Br. Ind. *via* Italy.†
Honduras, Br. C. America.
Honduras, Rep. C. America.
Hong Kong, China.¶
Hungary.
Hyderabad, Ind., *via* Italy.*†
Iceland Isld., Denmark.
India, British.¶
India (French Est'blish'ts in)

RATES OF POSTAGE TO FOREIGN COUNTRIES—*Continued.*

Ionian Isles, Greece.
Ireland.¶
Isle of Pines, Oceanica. (*Fr.*)
Italy.¶
Jamaica, Isld., W. I. (*Br.*)¶
Japan, Asia.¶
Java, Batavia, Asia (*Dutch*).
Jinsen (Corea), Jap. P. O. at
Kalgan, China, *via* Russia.
Kameroun.
Karakal, India. (*Fr.*)
Kashmir, Ind., *via* Italy.*†
Kiung-Chow, H'g K'g P. O.
Labrador.
Labuan, Philippine Isl. (*Br.*)
Ladakh, Thibet, *via* Italy.*
Ladrone Is., Oceanica (*Sp.*)
Lagos, W. Africa (*Br.*)
Larrache, Morocco. (*Span.*)
Les Saintes, Is., W. I. (*Fr.*)
Leeward Is., W. I. (*Br.*)
Liberia, Africa.
Lichtenstein, Princ. Austria.
Lombok, Asia. (*Dutch.*)
Low Islds., Oceanica. (*Fr.*)
Loyalty Is., Oceanica (*Fr.*)
Luxemburg (Gr. Duchy of).¶
Luzon, Philippine Is. (*Sp.*)
Macao Hong Kong P. O.
Macassar, Asia. (*Dutch.*)
Madagascar Isls., Afr. (Ste. Marie, Tamatave, Majunga and Ambositra, Andevorante, Fenerive, Fiaranantsoa, Foulpointe, Ivondro, Maevatanana, Mahambo, Mahanoro, Mahela, Maintirano, Mananjary, Morondava, Morotsangana, Nossi-Vé, Tananarive [also known as [Antananarivo, Vatomandry, Vohemar.
Madeira, Isld., Portugal.¶
Madura, Asia. (*Dutch.*)
Mahe, India. (*French.*)
Malacca Straits Sett's. (*Br.*)
Malta, Isld. (*British.*)
Mandalay, Br. Indian P. O.
Manila, Philippine Isls. (*Sp.*)
Mariana Is., Oceanica. (*Sp.*)
Marie Galante, Is., W. I. (*Fr.*)
Marquesas Is., Oce'ca. (*Fr.*)
Marshall Islands, Ger. Pro.
Martinique Is., W. I. (*Fr.*)
Massowah, R. Sea (It. P. O. at)
Mauritius Is., Africa. (*Br.*)
Mayotte, W. Africa. (*Fr.*)
Mazagan, Morocco. (*Span.*)
Melilla, N. Africa. (*Span.*)
Mindanao, Philip'ne Is. (*Sp.*)
Miquelon, Is , N. Am. (*Fr.*)
Mogador, Morocco (*Sp.*)
Moldavia, Roumania.
Moluccas, Asia. (*Dutch.*)
Monaco, Princip. of France.
Montenegro.
Montserrat, W. I. (*British.*)
Morocco, Fr. & Sp, P. O. in.
Mozambique, Africa. (*Port.*)
Muscat, British Indian P. O.
Mysore, Br. Ind., *via* Italy.†
Mytho, Cochin China. (*Fr.*)
Nassau, N. P. Bahamas. (*Br.*)
Natal, Africa, Brit. Col. of.
Navigators Islands. (Ger. P. O. at Apia.)
Netherlands.¶
Netherland Colonies in Asia, America and Oceanica.
Nevis, Isld., W. I. (*British.*)
New Caledonia, Ocean. (*Fr.*)
Newfoundland.
New Guinea, Oce'ca. (*Dutch.*)
New Guinea Company, Territory of, Ger. Pro.
New South Wales, including Lord Howe Island and Norfolk Island.
New Zealand, including Chatham Islands.
Nicaragua, Centr. America.
Ning-po, Hong Kong, P. O.
Norway.¶
Nossi-be, W. Africa. (*Fr.*)
Nubia, Egypt.
Obock, East Coast of Africa (French P. O. at.)
Ourga, China. *via* Russia.
Palawan, Philip'ne Is. (*Sp.*)
Panama, U. S. of Colombia.
Panay, Philip'ne Isl. (*Sp.*)
Papua, Oceanica. (*Dutch.*)
Paraguay, S. America.
Patagonia, S. America.
Pegu, British India.
Pekin, China, *via* Russia.
Penang, Straits Settlts. (*Br.*)
Penon de Gomera, N. Af. (*Sp.*)
Persia, Asia.
Persian Gulf, Br. Ind. P. O.
Peru.
Philippine Is., Ocea. (*Sp.*)
Pines, Isle of, Oceanica.
Pondicherry, India. (*Fr.*)
Porto Rico, W. I. (*Span.*)
Portugal.¶
Port. Col'o's, Asia & Africa.
Poulo-Condor, C. China. (*Fr.*)
Prince, Isld., Africa. (*Port.*)
Queensland.
Rabat, Morocco, Spa. P. O.
Reunion Isld., Africa. (*Fr.*)
Rhio-Riouw, Asia. (*Dutch.*)
Rodrigues Is., Africa. (*Br.*)
Roumania.
Russia.
Saba Islds., W. I. (*Dutch.*)
Saffi, Morocco, Span. P. O.
Saigon, Cochin China. (*Fr.*)
Salvador, Central America.
Samoan Islands (Ger. P. O. at Apia.)
Sandwich Islds., Oceanica.
San Domingo Republic, W. I.
San Marino Republic, Italy.
Senegal, W. Africa. (*Fr.*)
Senegambia, W. Africa. (*Br.*)
Servia.
Seychelles, Is., Africa. (*Br.*)
Shanghai (U. S. Postal Agency at.)
Shanghai, *via* Hong Kong.
Shanghai, *via* France.
Siam, Asia.
Sierra Leone, W. Af. (*Br.*)
Singapore, Asia. (*British.*)
Soudan, Egypt.
South Australia.
S. W. Africa, Ger. Pro.
Spain.
Spanish Colonies in Asia, Africa, America & Oce'ca.
St. Bartholomew, Is'ld, W. I. (*French.*)
St. Christopher I., W. I. (*Br.*)
St. Croix Isl., W. I. (*Dan.*)
St. Domingo, Republic, W. I.
St. Eustatius Is., W. I. (*Dut.*)
St. John Is., W. I. (*Dan.*)
St. Kitts Is., W. I. (*Br.*)
St. Lucia Is., W. I. (*Br.*)¶
St. Louis, W. Africa. (*Fr.*)
Ste. Marie Madagasc'r. (*Fr.*)
St. Martin, W. I. (*Fr. & Dut.*)
St. Pierre, W. I. (*French.*)
St. Thomas Is. W. I. (*Dan.*)
St. Thome Is., Afr. (*Port.*)
St. Vincent, W. I. (*Br.*)¶
Staten Island, S. America.
Straits Settlem'ts, Asia. (*Br.*)
Sumatra, Asia. (*Dutch.*)
Sumbawa, Asia. (*Dutch.*)
Surinam, S. America. (*Dut.*)
Swatow, Hong Kong P. O.
Sweden.¶
Switzerland.¶
Tahiti Isld., Oceanica. (*Fr.*)
Tamatave, Madagasc'r. (*Fr.*)
Tangier, F. & Span. P. O.
Tasmania.
Tenasserim, British India.
Terra del Fuego.
Tetuan, Morocco, Sp. P. O.
Tien-Tsin, China, *via* Russia.
Timor, Asia. (*Dut. & Port.*)
Tobago Isld., W. I. (*Br.*)¶
Togo, W. Africa, Ger. Pro.
Tonquin (French P. O. in.)
Toubouai, Oceanica. (*Fr.*)
Trinidad Isld., W. I. (*Br.*)
Tripoli (Italian P. O. at.)
Tschandok, Co. China. (*Fr.*)
Tuamotou, Oceanica. (*Fr.*)
Tunis, (Fr. and Italian P. O.)
Turkey—Europe and Asia.
Turk's Island, W. I. (*Br.*)
Uruguay, S. America.
Venezuela, S. America.
Victoria.
Vingh-Long, C. China. (*Fr.*)
Virgin Isles, W. I. (*British.*)
Wallachia, Roumania.
West Indies.
Western Australia.
Yanaon, India. (*French.*)
Zanzibar, Afr., *via* Aden.*

*Regarding exceptions, see Note H., p. 406.

COUNTRIES IN UNIVERSAL POSTAL UNION WITH WHICH THE UNITED STATES HAS SPECIAL CONVENTIONS.

Canada, comprising Provinces of *British Columbia*, *Manitoba*, *New Brunswick*, *Nova Scotia*, *Ontario*, *Prince Edward Island*, *Quebec*, and *North West Territories*.....
Mexico.....

Limit of letter-weight 30 gr. or 1 oz.; *postage-rates* on all classes of mail matter; the United States domestic rates; except seeds, plants, etc., for Canada, the rate upon which is 1 cent per oz.

COUNTRIES OR PLACES NOT IN UNIVERSAL POSTAL UNION.

Prepayment is compulsory.
† The limit of payment is at port of debarkation; for all other places, to destination.
‡ Samples are not accepted for these destinations.
§ Registration is allowed on letters and other articles. Fee, 10 cents.
‖ Registration is allowed *only* on letters. Fee, 10 cents.
¶ Money orders are issued at same rates as specified at top of page 381.
Postal cards cannot be sent from the United States to any of the following places *except* Canada.

COUNTRIES OR PLACES OF DESTINATION.	Per 15 Grams, or ½ Ounce.	Newspapers.		Other Printed Matter, Samples and "Commercial Papers."	
		Limit for Single Rate.	Postage for Single Rate.	Limit of Weig	Postage for Single Rate.
	Cts.	Oz.	Cts.	Oz.	Cts
Africa, except Egypt, Liberia, Congo, the Transvaal, British, French, Spanish and Portuguese Colonies, the Territories of South-West Africa, and of Togo, Western Africa (German Protectorates), Tunis, and the European post-offices in Morocco, Abyssinia, and Madagascar, by British Mail.....†	10	2	2	2	
Ascension Island. S. Atlantic, British Mail...	10	2	2	2	
Basutoland, *see* Cape Colony.					
Bechuanaland, S. Africa. British Mail.....§	10	no	2	2	2
Caffraria, *see* Cape Colony.					
Cape Colony, S. Africa, British Mail.....§¶	10	2	4	2	2
China, British Mail, *via* Brindisi.....§	10	2	2	2	2
Comoro Islands (except Mayotte) Mozambique Channel	5	no	2	2	1
Fiji Islands, *via* San Francisco and Sydney.....†‡	5	no	2	2	2
Griqualand, *see* Cape Colony.					
Kimberly, *see* Cape Colony.					
Madagascar, except St. Marie, Tamatave, Majunga and Ambositra, Andevorante, Fenerive, Fiaranantsoa, Foulpointe, Ivondro, Maevatanana, Mahambo, Mahanoro, Mahela, Maintirano, Mananjary, Morondara, Nossi-Vé, Tananarive, Vatomandry, Vohemar, by British Mail.....†	10	2	2	2	2
Morocco, except Spanish Possessions on West Coast.....†	10	2	2	2	2
Navassa, West Indies, direct mail.....†‡	5	no	2	2	2
Navigator's Islands, Pacific .....†‡	5	no	2	2	2
Orange Free State, *see* Cape Colony.					
Pitcairn Island, Pacific (*no registration.*) .....†‡	5	no	2	2	2
St. Helena, South Atlantic, British Mail.....§	10	2	2	2	2
Samoan Islands, *see* Navigator's Islands.					
Shanghai, direct, *via* San Francisco.....‡‖	5	no	2	2	2
Transvaal, South Africa. British Mail.....§	10	no	2	2	2

PARCELS POST.

STATEMENT SHOWING THE COUNTRIES TO WHICH PARCELS MAY BE SENT; THE DIMENSIONS, WEIGHT AND RATES OF POSTAGE APPLICABLE TO PARCELS, AND THE EXCHANGE POST OFFICES WHICH DISPATCH AND RECEIVE PARCELS POST MAILS.

Names of Countries.	Allowable Weight of Parcels.				Postage.		Exchange Post Offices.	
	Greatest Length.	Greatest Length and Girth Combined.	Greatest Girth.	Greatest Weight—Pounds.	For a Parcel not exceeding 1 Pound.	For every additional Pound or fraction of a Pound.	United States.	Foreign.
Bahamas	3 feet 6 inches.	6 feet.	.....	11	12 cts.	12 cts.	New York.	Nassau.
Barbadoes	3 " 6 "	6 "	.....	11	12 "	12 "	"	Bridgetown.
Colombia	2 "	.....	4 feet.	11	12 "	12 "	All offices authorized to exchange mails between the two countries.	
Costa Rica	2 "	.....	4 "	11	12 "	12 "		
The Danish West Indies	3 " 6 "	6 feet.	.....	11	12 "	12 "		
The Hawaiian Kingdom	3 " 6 "	6 "	.....	11	12 "	12 "	San Francisco.	Honolulu.
Honduras (British)	3 " 6 "	6 "	.....	11	12 "	12 "	New Orleans.	Belize.
Jamaica	3 " 6 "	6 "	.....	11	12 "	12 "	New York.	Kingston.
Leeward Islands	3 " 6 "	6 "	.....	11	12 "	12 "	"	St. John, Antigua.
Mexico	2 "	.....	4 feet.	11	12 "	12 "	All offices authorized to exchange mails between the two countries.	
Salvador	3 " 6 "	6 feet.	.....	11	12 "	12 "		
Guiana (British)	3 " 6 "	6 "	.....	11	12 "	12 "		
Windward Islands	3 " 6 "	6 "	.....	11	12 "	12 "		
Newfoundland	3 " 6 "	6 "	.....	11	12 "	12 "	New York, Philadelphia.	St. John's, N. F.

AMERICAN PHOTOGRAPHIC SOCIETIES.

ADRIAN CAMERA CLUB.—Adrian, Mich. Organized 1881. *President*, F. B. Stebbins; *Vice-President*, W. T. Barnum; *Secretary*, E. J. Stebbens, Adrian, Mich. This club is the Photographic Section of the Adrian Scientific Society. Meetings, Monday evenings, 8 o'clock.

AGASSIZ ASSOCIATION, MANHATTAN CHAPTER, N. Y. B.—141 East 40th Street. Organized 1881. *President*, C. F. Groth; *Vice-President*, Chas. Kromm; *Board of Trustees*, C. F. Groth, W. S. Miller, F. Kromm, E. Staubgaudt, E. B. Miller, H. T. Rowley, H. Breunich, W. T. Demarest; *Treasurer*, W. S. Miller; *Librarian*, C. J. Miller; *Secretary*, Ed. B. Miller, 141 East 40th Street. Place of meeting, 141 East 40th Street. Regular meetings, first Friday after first Monday of each month, evening. Annual meeting, first meeting each year. Membership March 1: Honorary, 3; active, 39; total, 42. Exhibition of photographs proposed to be held next fall (1894).

AKRON CAMERA CLUB.—Akron, Ohio. Organized November 1890, as the College Camera Club, name changed to Akron Camera Club, December, 1893. *President*, Prof. Charles M. Knight; *Vice-President*, Edwin Perrass; *Executive Committee*, officers act as Committee; *Treasurer*, Frank Adams; *Secretary*, Prof. Wm. D. Shipman, 231 S. Union Street, Akron, Ohio. Place of meeting, at the homes of the members. Ordinary meetings, second Tuesday of each month, at o'clock P.M. Special meeting at call of President. Annual meeting, the last regular meeting of the year. Membership September 1: Active, 22; total, 22. Exhibitions: at each meeting there is an exhibit of lantern-slides and mounted photos, and public exhibits are held February 22d.

ALBANY CAMERA CLUB.—29 Steuben Street. Organized October 21, 1887. *President*, John S. Paterson; *Vice-President*, Dayton Ball; *Directors*, W. W. Byington, Dr. S. B. Ward, Prof. Maurice Perkins, J. S. Van Buren, Karl J. Phisterer, C. B. Tillinghast, Charles S. Pease, Augustus Pruyn; *Treasurer*, E. J. Wheeler; *Librarian*, Charles L. Palmer; *Secretary*, Dr. C. E. Davis, 91½ Hudson Avenue, Albany, N. Y. Place of meeting, 29 Steuben Street, Albany, N. Y. Ordinary meetings, first Friday evening in each month, at 8 P.M. Special meetings on call. Annual meeting, first Friday evening in April. Membership April 6: Honorary, 2; active, 53; non-resident, 15; associate, 109; totol, 179. Exhibitions, ten or more lantern-slide during year, and one print exhibition, which this year was a joint one with Buffalo and Syracuse clubs. Prints were exhibited in each city. The club is in excellent condition financially, and in the work and interest members take in photography.

AMATEUR PHOTOGRAPHERS' ASSOCIATION.—Headquarters at Colfax, Colorado. Organized 1893. *President*, R. Minton; *Vice-President*, W. Thaute; *Instructor*, O. Mayo; *Secretary-Treasurer*, Frank Myers, Colfax, Col.

AMATEUR PHOTOGRAPHIC ASSOCIATION.—Selma, Ala. Organized December, 29, 1887. *President*, William S. Monk; *Librarian*, Fritz E. Keipp; *Secretary and Treasurer*, S. Orlando Trippe, Selma, Dallas Co., Ala. Place of meeting, Harrison's Studio. Ordinary meetings, first Thursday in each month. Special meetings at call of President. Annual meeting, first Thursday in January. Membership September 1: Active, 16; total 16.

AMERICAN LEAGUE OF AMATEUR PHOTOGRAPHERS, THE.—Organized, New York, July 12, 1892. *President*, Paul L. V. Thiery; *Vice-President*, Dr. George L. Parmele of Hartford; Miss Frances B. Johnston of Washington, D. C.; *Executive Committee*, Paul L. V. Thiery, Dr. George L. Parmele, Miss F. B. Johnston, W. S. Drew, R. M. Fuller, T. J. Burton, Dr. James H. Stebbins, Jr., H. S. Fowler, O. S. Teale, C. G. Hine; *Treasurer*, W. H. Drew, Lynn, Mass.; *National Delegate*, R. M. Fuller, Cranford, N. J.; *Secretary*, T. J. Burton, 113 West 38th Street. Place of meeting, 113 West 38th Street, New York. Annual meeting, second Tuesday in May. Membership September 1: active, 1253; total, 1253. Publication, *The Developer*, monthly.

Officers of the New York Division: *President*, James H. Stebbins, Jr., Society of Amateur Photographers, New York; *First Vice-President*, Dr. Ely Van De Warker, Syracuse Camera Club; *Second Vice-President*, Frank La Manna, Brooklyn Academy of Photography; *Secretary-Treasurer*, H. S. Fowler, Brooklyn Academy of Photography.

Officers of the New Jersey Division: *President*, Oscar S. Teale, President of the Plainfield Camera Club: *First Vice-President*, Wm. A. Halsey, of Newark Camera Club; *Second Vice-President*, A. J. Thomas, President Hoboken Camera Club; *Secretary-Treasurer*, T. W. Harvey, M.D., President of the Orange Camera Club.

AMERICA, PHOTOGRAPHERS' ASSOCIATION OF.—Place of meeting in 1895, Detroit. *President*, J. S. Schneider, Columbus, Ohio; *First Vice-President*, R. P. Bellsmith, Cincinnati, Ohio; *Second Vice-President*, Geo. Steckel, Los Angeles, Cal.; *Secretary*, Pirie McDonald, Albany, N. Y.; *Treasurer*, J. Ed. Rösch, St. Louis, Mo.

ASSOCIATION OF GERMAN PHOTOGRAPHERS.—New York. Organized March 4, 1868. *President*, Anton Mildenberger; *Vice-President*, Karl Kutscher; *Executive Committee*, A. Esselborn, H. Borgfeld, L. Schill; *Treasurer*, G. L. Pellnitz; *Librarian*, Otto Buehler; *Secretary*, L. Schmid, 62 East 4th Street. Place of meeting, Metropolitan Assembly Rooms, 62 East 4th Street. Ordinary meetings, second and fourth Wednesdays of every month, at 8 P.M. Annual meeting, second Wednesday in March. Membership: Honorary, 6; active, 42; corresponding, 1; total, 49.

BALTIMORE CITY, PHOTOGRAPHIC CLUB OF.—703 Madison Ave. Organized September 1, 1891. *President*, A. S. Murray; *Vice-President*, Dr. Frank Slothower; *Board of Managers*, A. S. Murray, Dr. Frank Slothower, E. M. Barker, C. E. Needles, A. J. Godby, B. G. Buck, F. W. McAllister; *Treasurer*, E. M. Barker; *Secretary*, Charles E. Needles, 404 Cathedral Street, Baltimore, Md. Place of meeting, 703 Madison Avenue. Ordinary meetings, every Tuesday evening. Monthly meetings, first Tuesday in each month, 8 P.M. Annual meeting, first Tuesday in April, 8 P.M. Membership April 1, 1894: Honorary, 48; active, 58; corresponding, 4; ladies, 4; total, 114. Exhibitions, annual lantern slide.

BOSTON CAMERA CLUB.—Boston, Mass. Organized 1881 as "The Boston Society of Amateur Photographers." Reorganized in 1886 under present name. Incorporated April 6, 1887. *President*, Edward R. Andrews; *Vice-Presidents*, George M. Morgan, William Sumner Briggs, J. Prince Loud; *Executive Committee*, Edward R. Andrews, Geo. M. Morgan, Wm. S. Briggs, J. Prince Loud, Wilbur C. Brown, Owen A. Eames, Charles Sprague, Charles H. Currier, Joseph T. Greene, David W. Lewis, John C. Holman, Francis H. Manning, Ernest A. Cockayne; *Treasurer*, Owen A. Eames; *Librarian*, Charles Sprague; *Secretary*, Wilbur C. Brown, 50 Bromfield Street, Boston, Mass. Place of meeting, Club Rooms, 50 Bromfield Street. Ordinary meetings, first Monday of each month, except July, August and September, at 8 P.M. Special meetings at call of President or five members. Annual meeting, first Monday in January. Membership March 6, 1894: Honorary, 6; active, 90; associate, 8; total, 104. Exhibitions every month. Annual exhibitions of the work of members in January. Joint exhibitions with the Photographic Society of Philadelphia and the Society of Amateur Photographers of New York, open to all photographers, both amateur and professional, throughout the world, are held in rotation annually in Philadelphia, New York and Boston. New York, 1894; Boston, 1895; Philadelphia, 1896; New York, 1897, etc.

BRIDGETON CAMERA SOCIETY.—Nos. 48 and 50 East Commerce Street, Bridgeton, N.J. Organized January 27, 1890. Incorporated March 25, 1893. *President*, Henry A. Janvier; *Vice-President*, George Hampton; *Board of Managers*, H. W. Fithian, H. L. Reeves, S. E. Bowen; *Treasurer*, Sydney E. Bowen; *Recording Secretary*, Oscar F. Anderson; *Corresponding Secretary*, W. R. Elmer, 230 East Commerce Street, Bridgeton, N. J. Ordinary meetings, first Tuesday of each month, 8 P.M. Annual meeting, the regular meeting in February. Membership September 1: Active, 33; corresponding, 1; total, 34. Exhibition is held in February at a date fixed at a previous meeting. This year it was held on the 14th of February, and was a grand success.

BROOKLYN ACADEMY OF PHOTOGRAPHY.—177 Montague Street, Brooklyn, N.Y. Organized February, 1887. *President*, John Merritt, M.D.; *First Vice-President*, F. Dana Reed; *Second Vice-President*, Starks W. Lewis; *Trustees*, the officers and five others, as follows: Frank LaManna, A. S. Barney, Samuel Baron, A. R. Pardington, H. B. Fullerton; *Treasurer*, Wm. T. Wintringham; *Librarian*, Wm. Arnold; *Corresponding Secretary*, Harry S. Fowler, 578 Halsey Street, Brooklyn; *Recording Secretary*, Aug. A. Goubert. Place of meeting, 177 Montague Street. Ordinary meetings, first Monday in each month at 8 P.M. Special meetings at the call of the President. Annual meeting, first Monday in February at 8 P.M. Membership September 1: Honorary, 6; active, 92; associate, 17; corresponding, 15; total, 130. Exhibitions: Lantern exhibitions monthly, from November to May; print exhibitions in May.

BROOKLYN INSTITUTE, DEPARTMENT OF PHOTOGRAPHY OF THE.—*President*, Wm. H. Cooper; *Vice-President*, Mrs. C. N. Burdett; *Executive Committee*, Officers of the Dept. and G. W. Wundram, Prof. W. C. Peckham, G. W. Street, M. R. Jones, J. F. Flagg; *Curator*, Dr. L. E. Meeker; *Secretary*, Gould W. Hart, 849 Monroe Street, Brooklyn. Place of meeting, 201 Montague Street. Ordinary meetings, every Thursday, 8 P.M. Special meetings, one each month. Annual meeting in May. Membership September 1: Total, 275. Exhibitions every year, in May.

BROOKLYN, PHOTOGRAPHIC ASSOCIATION OF.—Brooklyn, N. Y. *President*, C. M. Heid; *Secretary*, E. F. Wagner, 716 Greene Avenue, Brooklyn, N. Y.

BUFFALO CAMERA CLUB.—Organized October 10, 1888. *President*, Willis O. Chapin; *Vice-President*, G. Hunter Bartlett; *Directors*, Willis O. Chapin, G. Hunter Bartlett, Dr. M. D. Mann, A. G. Hauenstein, Charles R. Wilson, Charles E. Hayes, H. H. Boyce, George J. Bailey and Dr. H. M. Hill; *Treasurer*, Charles E. Hayes; *Librarian*, Charles R. Wilson; *Secretary*, Charles R. Wilson, 298 Main Street, White Building, Buffalo, N. Y. Place of meeting, Club's Rooms, 619 Main Street, Arcade Building. Ordinary meetings, second Tuesday each month, 8 P.M. Special meetings, subject to call. Annual meeting, second Tuesday in October. Membership April 1: Active, 50; corresponding, 10; total, 60. Annual exhibition of photographic work and material. Course of lectures on Photography.

BUCHTEL COLLEGE CAMERA CLUB.—Organized 1890. *President*, Prof. C. M. Knight, Akron, Ohio; *Treasurer*, C. H. Shipman; *Secretary*, Miss Agnes M. Claypole, 603 Buchtel Avenue, Akron, Ohio.

"CAMERADS."—Headquarters at Rutgers College, New Brunswick, N. J. *President*, Prof. P. T. Austin, Ph.D.; *Secretary*, Dr. H. Iredell, Lock Box 34, New Brunswick, N. J.

CAMERA DEPT. NAT. HIST. SOCIETY, MILLBURY, MASS.—Organized June, 1888. *President*, George C. Webber, M.D.; *Vice-President*, T. D. Bristol, M.D.; *Executive Committee*, Geo. C. Webber, M.D., F. B. Luce, T. E. Bottomley; *Treasurer*, same as Nat. Hist. Soc.; *Secretary*, T. E. Bottomley, Box 467, Millbury, Mass. Place of meeting, Nat. History Rooms. Ordinary meetings, first Monday in month. Special meetings, when called—no special time. Annual meeting, June. Membership September 1: Honorary, 23; active, 9; corresponding, 1; total, 33. The original club has amalgamated with Nat. History Soc., and nearly all the old members are working individually, although all are in the Camera Club Dept. of Nat. Hist. Society.

CAPITOL BICYCLE CLUB, PHOTOGRAPHIC SECTION OF.—409 Fifteenth Street, N. W., Washington, D. C. *President*, Chas. H. Schaaf; *Secretary*, B. S. Graves, 915 N. Street, N.W., Washington, D.C.

CAPITAL CAMERA CLUB.—Washington, D. C. Organized May 1, 1891. *President*, José M. Yznaga; *Vice-President*, Eugene Lee Ferguson; *Secretary*, Frank B. Dante, 401 Seventh Street, N. W.; *Board of Directors*, the above officers and Chas. E. Fairman, Dr. Robt. Rayburn, Dr. Wm. P. Herbst; *Treasurer*, Charles L. Du Bois; *Room Committee*, Albert Le Breton, Howard G. Douglas, E. B. Stocking. Place of meeting, 401 Seventh Street, N. W. Ordinary meetings, first and third Saturdays in each month. Annual meeting, first Saturday in May. Membership: Active, 50; total, 50. Exhibitions, annual in December.

CENTRAL CAMERA CLUB OF THE BROOKLYN Y. M. C. A.—502 Fulton Street, Brooklyn, N. Y. Organized 1888. *President*, Wm. H. Lowery; *Vice-President*, A. C. Ruprecht; *Treasurer*, E. A. Crowell; *Secretary*, B. A. Burger, 160–62 Atlantic Avenue, Brooklyn, N. Y. Place of meeting, "Studio," 502 Fulton Street. Ordinary meetings, second and fourth Thursdays of each month at 8 P.M.

Special meetings, by order of President or on demand of any five members. Annual meeting, second Thursday in January. Membership September 1: Honorary, 3; active, 27; total, 30. Publications, *Y. M. C. A. Bulletin.* Exhibitions: Lantern-slide exhibitions first meeting of each month. Demonstrations or reading of papers second meeting of each month. Public lantern-slide exhibitions during the winter season. Annual print exhibit in the fall.

CHICAGO CAMERA CLUB.—184 Wabash Avenue, Chicago, Ill. Organized 1889. *President*, Prof. M. L. Williston; *Secretary*, P. E. Green, Edgewater, Ill.

CHICAGO LANTERN SLIDE CLUB.—Organized October, 1886. *President*, Dr. T. W. Sheardown; *Executive Committee*, officers; *Secretary*, W. A. Morse, 20 Kemper Place. Place of meeting, 913 Masonic Temple. Ordinary meetings, second and fourth Wednesdays. Annual meeting, January. Membership September 1: Honorary, 2; active, 21; total, 23.

CHICAGO PHOTOGRAPHIC SOCIETY.—Organized 1889. Headquarters Art Institute, Chicago, Ill. *President*, Judge J. B. Bradwell; *Vice-President*, J. H. Smith; *Secretary*, J. Maul, Chicago, Ill.

CALIFORNIA CAMERA CLUB.—San Francisco. *President*, Chas. Albert Adams; *First Vice-President*, H. C. Tibbitts; *Second Vice-President*, W. J. Street; *Directors*, the officers, and T. H. Jones, M. E. Goodrum, W. B. Webster, F. W. Fuller; *Secretary*, C. F. Cormack; *Corresponding Secretary*, C. S. Close; *Treasurer*, Dr. E. G. Eisen; *Librarian*, H. C. Owens. Membership May 1: Honorary, 4; active, 143; associate, 24; subscribing, 221; total, 392. Exhibitions, one lantern-slide exhibition each month, free to the public. Annual print exhibition.

CINCINNATI SOCIETY OF NATURAL HISTORY (PHOTOGRAPHIC SECTION).—Organized January 1884. *President*, H. J. Buntue; *Vice-President*, A. L. Fogg; *Treasurer*, E. H. Barton; *Librarian*, Arch. I. Carsen, M.D.; *Secretary*, Edward E. Shipley, P. O. Box 285, Cincinnati, O. Place of meeting, 108 Broadway. Ordinary meetings, second and fourth Monday evenings of each month. Special meetings, on call of President. Annual meeting, first Monday of April. Membership September 1: Honorary, 1: active, 100; total, 101. Exhibitions: Print exhibition. Annual outing May 30th each year. Annual lantern-slide exhibition.

CLEVELAND CAMERA CLUB.—Organized 1887. *President*, Frank Dorn; *Vice-President*, Alf. Ogier; *Executive Committee*, J. A. Duncan, Prof. J. Bolton; *Treasurer*, William Dorn; *Secretary*, Robert Dayton, M.D., 5 Euclid Avenue, Room No. 2, Cleveland, Ohio. Place of meeting, 5 Euclid Avenue, Room No. 9. Ordinary meetings, first and third Tuesdays of each month. Annual meeting, first Tuesday in December. Membership September 1: Active, 40 on the roll—about 22 attend meetings.

COLORADO CAMERA CLUB.—Denver, Colorado. Organized 1892. *President*, W. H. Jackson; *Secretary*, E. I. Kern, Post-office Box 333, Denver, Col.

COLUMBUS CAMERA CLUB.—Y. M. C. A. Building, Columbus, Ohio. Organized October 6, 1884. Incorporated February, 1891. *President*, John Field; *Vice-President*, C. H. Doty; *Directors*, John Field, C. H. Doty, W. B. Kimball, C. S. Bradley, Hester C. Getz, P. P. Smythe, S. C. Bradford, J. J. Jennings, F. H. Howe; *Treasurer*, C. S. Bradley; *Librarian*, Hester C. Getz; *Secretary*, W. B. Kimball, No. 32 East Spring Street, Columbus, O. Place of meeting, Columbus Camera Club, Y. M. C. A. Building. Ordinary meetings, third Thursday of each month. Special meetings, subject to the call of the President. Annual meeting, third Thursday in December. Membership September 1: Honorary, 4; active, 60; total, 64. Annual outing, May 30.

CRANFORD CAMERA CLUB.—Cranford, Union Co., N. J. Organized September 13, 1888. *President*, Wm. Chamberlain; *Treasurer*, J. M. P. Joseph; *Secretary*, A. H. Plummer, Cranford, Union Co., N. J. Place of meeting, Cranford, N. J. Ordinary meetings, first Thursday in every month. Special meetings whenever called. Membership September 1: Honorary, 1; active, 11; corresponding, 2; total, 14.

DAGUERRE CAMERA CLUB.—Established 1889. 189 State Street, Chicago, Ill. *President*, F. D. Blish; *Secretary*, W. B. Sizer, 189 State Street, Chicago. Ill.

DELAWARE CAMERA CLUB.—Organized 1891. Equitable Building, Wilmington, Del. *President*, J. M. Rogers; *Secretary*, Miss E. G. Walton, 907 West Street, Wilmington, Del.

DETROIT LANTERN CLUB.—Museum of Art, Jefferson Avenue, Detroit, Mich. *President*, F. E. Kirby; *Secretary*, D. F. Henry, 52 Woodward Avenue, Detroit, Mich.

HAMILTON ASSOCIATION CAMERA CLUB.—Hamilton, Ont. Organized 1892. *President*, S. Briggs; *Secretary*, W. White, 9 James Street, North, Hamilton, Ont.

HARTFORD CAMERA CLUB, OF HARTFORD, CONN.—Organized 1885. Incorporated March 8, 1892. *President*, H. O. Warner; *Corresponding Secretary*, R. A. Wadsworth; *Executive Committee*, Dr. G. L. Parmele, Col. George Pope, Charles R. Nason; *Treasurer*, F. A. Thompson; *Secretary*, Lincoln S. Hickmott, P. O. Box 480. Place of meeting, rooms, 25 Pratt Street. Ordinary meetings, 7.30 P.M.; Special meetings, 7.30 P.M.; Annual meeting, second Tuesday in October. Membership to date: Honorary, 8; active, 62; total, 70. Exhibitions, annual in February or March. Lawn, water-color, oil paintings, etc., etc., at any time.

HARVARD CAMERA CLUB.—Harvard University, Mass. Organized 1889. *President*, F. E. Frothingham; *Secretary*, F. L. Omsted, 13 Wadsworth House, Cambridge, Mass.

HIAWATHA CAMERA CLUB.—Minneapolis, Minn. *President*, Dr. M. G. Jennison; *Secretary*, C. A. Hoffman, 20 South Fourth Street, Minneapolis, Minn.

HOBOKEN CAMERA CLUB.—Hoboken, N. J. *President*, A. J. Thomas; *Secretary* L. W. Wolf, 1136 Garden Street, Hoboken, N. J.

If Camera Club of Jersey City, N. J.—Organized November, 1891. *President*, Joseph Cottier; *Vice-President*, Frederick Frambach; *Treasurer*, Stephen Reade; *Secretary*, A. B. Guilford, 341 Webster Avenue, Jersey City, N. J. Place of meeting, house of President. Ordinary meetings, second Friday in each month at 8 o'clock. Special meetings, at call of President. Annual meeting, second Friday in December. Membership September 1: Active, 14; total, 14. Two exhibitions during winter months; outings in summer.

Indianapolis Camera Club.—Indianapolis, Ind. Organized November 18, 1887. *President*, Charles McBride; *Vice-President*, H. C. Chandler; *Executive Committee*, John T. Harris, Rembrandt Steele, Henry Kothe; *Treasurer*, *Librarian*, *Secretary*, care of H. Lieber, 33 South Meridian. Places of meeting, various. Ordinary meetings, first Tuesday of each month. Special meetings, on call of Executive Committee. Annual meeting, November. Membership September 1: Honorary, 1; active, 35; total, 36.

Kansas City, Photographic Society of.—Organized 1891. Headquarters, 1432 Walnut Street, Kansas City, Missouri. *President*, J. P. Reymond; *Secretary*, C. H. Clarke, 613 Delaware Street, Kansas City, Mo.

Lancaster City and County Association of Photographers.—Organized 1893. *President*, W. L. Gill; *Vice-President*, J. E. Rote; *Secretary*, H. A. Black, 24 West King Street, Lancaster, Pa.

Lawrence Camera Club.—Lawrence, Mass. Organized 1893. *President*, J. H. Green; *Secretary*, R. A. Hale, Lawrence, Mass.

Louisville Camera Club.—Louisville, Ky. *President*, Prof. E. H. Marks; *Secretary*, R. L. Stevens, 1100 West Main Street, Louisville, Ky.

Lowell Camera Club, The.—Lowell, Mass. Organized January, 1889. Incorporated March, 1892. *President*, Paul Butler; *Vice-Presidents*, Wm. P. Atwood, W. E. Badger; *Executive Committee*, he following *Directors* with the other officers, F. T. Walsh, Charles Runels, John I. Coggeshall; *Treasurer*, M. A. Taylor; *Librarian*, Fay H. Martin; *Secretary*, George A. Nelson, 203 Appleton Street, Lowell, Mass. Place of meeting, Runel's Building. Special meetings: all meetings are special, subject to the call of the Executive Committee. Annual meeting, first Tuesday in March. Membership September 1: Active, 30; total, 30.

Lynn Camera Club, The.—40 Broad Street, Lynn, Mass. Organized January 3, 1888. *President*, W. H. Drew; *Vice-President*, J. N. Smith; *Executive Committee*, W. H. Drew, J. N. Smith, C. A. Lawrence; *Board of Managers*, E. F. Bacheller, J. W. Tapley; *Directors' Council*, W. A. Pevear, W. B. Gifford; *Treasurer*, E. F. Bacheller; *Librarian*, J. W. Tapley; *Secretary*, Charles A. Lawrence, Club House, 42 Broad Street, Lynn, Mass. Ordinary meetings, first Tuesday in each month. Special meetings at call of President. Annual meeting, regular January meeting. Membership September 1: Honorary, 1; active, 30; total, 31.

Mattapan Camera Club.—Mattapan, Mass. Organized May, 1890. *President*, John A. Locklin; *Vice-President*, next oldest member; *Executive Committee*, John A. Locklin, Alfred L. Karcher, E. Sonnenbrodt; *Treasurer*, Alfred L. Karcher; *Librarian*, the secretary; *Lecturer*, Henry N. Lochlin; *Secretary*, Erdmann Sonnenbrodt.

Place of meeting, private residences of members. Time of meeting and place, when necessary, notification of same sent by Secretary. Annual meeting, May. Membership September 1: Active, 15; total, 15. Exhibitions: Lantern-slide exhibitions once a month during season of N. E. Lantern Slide Exchanges. Free exhibitions given to churches and schools when invited to.

MEMPHIS AMATEUR PHOTOGRAPHIC CLUB.—Memphis, Tenn. Organized 1893. *President*, S. J. Latta; *Secretary*, G. O. Friedel, 165 Gayoso Street, Memphis, Tenn.

MINNEAPOLIS CAMERA CLUB.—Minneapolis, Minn. Organized and incorporated June, 1892. *President*, W. Channing Whitney; *Vice-President*, A. L. Eidemiller; *Board of Directors*, W. B. Augir, G. W. Beach, C. A. McCallom, M.D., H. E. Murdock, W. M. Tenny and A. L. Broughton; *Treasurer*, A. S. Williams; *Secretary*, C. J. Hibbard, 409 Hennepin Avenue, Minneapolis, Minn. Place of meeting, American Terrace, 15 North Fourth Street. Ordinary meetings, second Wednesday of each month, 8 P.M. Special meetings at the call of the President, and during winter months meeting every Wednesday evening. Annual meeting, regular April meeting. Membership March 1, 1894: Active, 46; associate, 10; total, 56. Exhibitions: Member of American Lantern Slide Interchange. Annual outing, Decoration Day.

MONTREAL CAMERA CLUB.—Organized 1890. Incorporated 1892. *President*, Prof. D. P. Penhallow, F.R.S.C., F.R.M.S.; *Vice-President*, E. Stanger; *Executive Committee*, A. J. Ferguson, Albert Holden, Alex. Henderson, Howard T. Barnes, Geo. R. Prowse, A. C. Lyman; *Hon. Secretary-Treasurer*, Alfred W. Cole, 28 Victoria Street, Montreal. Ordinary meetings, first and third Mondays in each month from September till June, 8 P.M. Annual meeting, first Monday in May. Membership September 1: Active, 70; total, 70. Exhibition and competition held annually in February.

MYSTIC CAMERA CLUB.—Medford, Mass. Organized June 4, 1889. Incorporated March 17, 1891. *President*, B. D. B. Bourne; *Vice-President*, H. A. Huff; *Executive Board*, B. D. B. Bourne, H. A. Huff, George S. T. Fuller, John F. Wade, Jos. B. Thaxter, Jr., Charles D. Tucker, John M. Preston; *Treasurer*, John F. Wade; *Librarian*, F. A. Newcomb, Jr.; *Historian*, Will C. Eddy; *Secretary*, Geo. S. T. Fuller, 35 Dexter Street, Medford, Mass. Place of meeting, Riverside Block, Main Street. Regular meetings, first and third Tuesdays of each month. Special meetings at the call of the Executive Board. Annual meeting, January 1. Membership January 1: Honorary, 4; active, 40; total, 44. Annual exhibition held in April.

NEWARK CAMERA CLUB.—828 Broad Street, Newark, N. J. Organized April 18, 1888. *President*, Thomas A. Hine; *Vice-President*, J. M. Foote; *Executive Committee*, W. Archibald, Harry W. Smith, Wm. A. Halsey, Charles Le Roy, Frank S. Olds, A. C. Munn, H. C. McDougall, J. M. Foote, Fred. A. Schuetz (9 in all); *Treasurer*, C. G. Hine; *Secretary*, D. S. Plumb, 24 Boudinot Street, Newark, N. J. Place of meeting, 828 Broad Street. Ordinary meetings, second and fourth Monday evenings in each month. Special meetings, subject to call of President. Annual meeting, second Monday evening in April. Membership September 1: Honorary, 11; active, 59; asso-

ciate, 8; total, 78. Exhibitions: Two each year, spring and autumn, for club lantern slides. Print exhibitions when deemed advisable by the Executive Committee.

NEWARK, DELAWARE, CAMERA CLUB OF.—Organized 1892. *President.* Prof. F. D. Chester; *Vice-President*, F. W. Curtis; *Secretary*, Prof. W. H. Bishop, Newark, Del.

NEW BRITAIN CAMERA CLUB.—New Britain, Conn. Organized 1892. *President*, E. M. Hulbert; *Secretary*, F. B. Wood, 273 Main Street, New Britain, Conn.

NEW HAVEN CAMERA CLUB.—New Haven, Conn. Organized 1893. *President*, G. F. Newcomb; *Secretary*, F. J. Chatterton, 173 Blatchley Street, New Haven, Conn.

NEW ORLEANS CAMERA CLUB.—No. 12 Union Street, New Orleans, La. Organized December 17, 1886. Incorporated May 3, 1888. *President*, Hon. Bernard C. Shields; *Vice-President*, S. L. Mitchel; *Board of Directors*, B. C. Shields, S. L. Mitchel, H. C. Delery, L. E. Bowman, R. S. Charles, Jr., Dr. W. R. Mandeville, J. Theo. Tudury, W. Gowland, P. Reynes; *Treasurer*, H. C. Delery; *Librarian*, Percy S. Benedict, 37 Camp Street; *Secretary*, R. S. Charles, Jr., care Illinois Central R. R. Co., Howard Avenue and Rampart Street. Place of meeting, 12 Union Street. Informal meetings, every Wednesday, 8 P.M. Business meetings, first Wednesday of every month. Annual meeting, first Wednesday of November. Membership September 1: Honorary, 12; active, 96; corresponding, 10; contributing, 1; total, 119. Exhibitions: as member of American Lantern-Slide Interchange, lantern exhibitions every month, no regular date. E. M. Haskell, Chairman of Lantern Committee. Competitive print exhibition in May. Competitive lantern-slide exhibition in October.

NEW YORK CAMERA CLUB.—Organized and Incorporated December 14, 1888. *President*, William J. Cassard; *Vice-President*, William Bunker; *Secretary*, Harry B. Reid; *Treasurer*, Robert J. Devlin, M.D.; *Librarian*, Charles W. Stevens, M.D. *Board of Trustees*, William J. Cassard, William Bunker, R. T. H. Halsey, Joseph T. Low, John V. Van Woert, Robert J. Devlin, M.D., Lindsay C. Ivory, Harry B. Reid, David Williams. *Committee on Admissions*, Francis R. Hitchcock, Chairman; William D. Murphy, Charles W. Stevens, M.D. *House Committee*, William Bunker, Chairman; Joseph T. Low, Lindsay C. Ivory, Francis R. Hitchcock, J. Arthur Booth, M.D. *Auditing Committee*, C. Volney King, Chairman; Joseph T. Low, A. T. Gillender, William T. Buckley, John V. Van Woert. *Lantern-Slide Committee*, R. T. H. Halsey, Chairman; William A. Fraser, Henry A. Blyth, Charles W. Stevens, M.D., William D. Murphy. *Committee on Exhibitions*, William D. Murphy, Chairman; William Herbert, W. H. Richardson, John V. Van Woert, James B. Hard. *Committee on Photographic Literature and Meetings*, Samuel W. Bridgham, Chairman; Arther H. Elliott, Ph.D., John V. Van Woert, Edward H. Day. Place of meeting, Club rooms, 314 Fifth Avenue. Ordinary meetings, monthly. Annual meeting, Second Wednesday in January. Membership September 1: Honorary 5; active, 100; corresponding, 2; total, 107. Exhibition of prints annually. Lantern-slides every two weeks during the season.

New York, Society of Amateur Photographers of.—*President*, R. A. B. Dayton; *Vice-President*, F. C. Elgar; *Directors*, R. L. Bracklow, H. S. Mack, E. T. Birdsall, Louis T. Brush, A. E. Helmich, J. T. Nagel, M.D., F. D. Skeel, M.D., Albert Stetson; *Treasurer*, C. C. Roumage; *Librarian*, R. L. Bracklow; *Recording Secretary*, A. P. Schoen; *Corresponding Secretary*, T. J. Burton, 113 West 38th Street. Place of meeting, 113 West 38th Street. Ordinary meetings, second Tuesday each month, except July and August, 8 P.M. Special meetings on call of President. Annual meeting, second Tuesday in April. Membership September 1: Honorary, 14; active, 147; sub., 34; corresponding, 48; total, 243. Exhibitions, members' exhibition (print) every spring. Lantern exhibition fourth Friday each month.

Oakland Camera Club.—Oakland, Cal. *President*, I. E. Thayer; *Secretary*, Miss G. H. Carlton, 716 Nineteenth Street, Oakland, Cal.

Ohio, Photographers' Association of.—Next place of meeting, Columbus, Ohio. *President*, A. L. Bowersox, of Dayton; *First Vice-President*, J. A. Pfeifer, of Columbus; *Second Vice-President*, Mr. Van Loo, of Toledo; *Treasurer*, G. H. Barnum, of Springfield; *Secretary*, W. N. Brenner, of Bucyrus.

Old Colony Camera Club.—Smith Building, Liberty Street, Rockland, Mass. Organized February 1, 1890. *President*, David Smith; *Vice-President*, Emory H. Jenkins; *Treasurer*, Emory H. Jenkins, *Librarian*, Fred. Ames; *Secretary*, Silas Gurney, Rockland, Mass. Place of meeting, Smith Building, Liberty Street, Rockland, Mass. Ordinary meetings, every alternate Tuesday evening, at 7.30 P.M. Special meetings at the call of the President. Annual meeting, first Tuesday in January. Membership September 1: Active, 16; total, 16.

Orange Camera Club.—Orange, N. J. *President*, T. W. Harvey; *Secretary*, H. A. Harvey, Jr., 455 Main Street, Orange, N. J.

Paterson Y. M. C. A. Camera Club.—Paterson, N. J. Organized May, 1893. *President*, C. M. Giles; *Executive Committee*, C. M. Giles, Chas. D. Cooke, Wm. M. Moore; *Treasurer*, Wm. M. Moore; *Secretary*, Chas. D. Cooke. Place of meeting: meetings adjourned until fall, when a new place is to be selected. Regular meetings will be resumed the first Monday in September. Annual meeting, first Monday in May. We expect to dissolve connection with the Y. M. C. A. and reorganize as an independent club in the fall.

Pawtucket Camera Club.—Pawtucket, R. I. *President*, F. G. Perry; *Secretary*, Charles H. Hyde, 131 Garden Street, Pawtucket, R. I.

Pennsylvania, Camera Club of.—Organized 1889. Headquarters at College Hall, University of Pennsylvania, Thirty-sixth Street, Philadelphia, Pa. *President*, H. P. Busch; *Secretary*, P. H. Wilson, 3931 Walnut Street, Philadelphia, Pa.

Photographic Association of Canada.—Organized 1883. *President*, A. M. Cunningham, Hamilton, Ont.; *Vice-President*, F. Cooper, London; J. Fraser Bryce, Toronto; W. F. Johnson, Picton; *Executive Committee*. Officers; *Secretary-Treasurer*, E. Poole, St. Catharines, Ont. Place of meeting, Toronto. Annual meeting, November first and second. Membership September 1: Honorary, few. Exhibitions, October 31, November 1 and 2, at Toronto.

PHOTOGRAPHICAL SECTION OF THE AMERICAN INSTITUTE.—Organized March 26, 1859. *President*, Henry J. Newton; *Vice-President*, Cornelius Van Brunt; *Executive Committee*, Officers of the Section; *Treasurer*, William Dean; *Librarian*, George Whitfield, Jr.; *Secretary*, Oscar G. Mason, Photographical Department Bellevue Hospital, New York City. Place of meeting, 111–113–115 West 38th Street. Ordinary meetings, first Tuesday of each month, except July and August, at 8 o'clock P.M. Special meeting upon call of officers. Annual meeting, first Thursday in February. Membership September 1: Total, about 1800. Exhibition, annual.

PHILADELPHIA, PHOTOGRAPHIC SOCIETY OF.—10 South Eighteenth Street. Organized 1862. *President*, Joseph H. Burroughs; *Vice-Presidents*, Charles R. Pancoast, Robert S. Redfield; *Board of Directors*, five officers and John C. Browne, John G. Bullock, John Carbutt, Samuel Castner, Jr., J. Hunter Ewing, Alexander Hemsley, Frederic E. Ives, William N. Jennings, Albert B. Parvin, William H. Rau, Anthony W. Robinson, Samuel Sartain; *Treasurer*, George Vaux, Jr.; *Secretary*, Edmund Stirling, care of *Public Ledger*, Phila. Place of meeting, 10 South Eighteenth Street. Ordinary meetings, second Wednesday evening of each month. Visitors' meetings, first Wednesday evening of each month. Members' meetings, fourth Wednesday evening of each month. Annual meeting, second Wednesday evening in April. Membership: Active and life, 186. Publications, *Journal of the Photographic Society of Philadelphia*. Exhibitions: Triennial, under agreement with Society of Amateur Photographers of New York, and Boston Camera Club; also Members' Exhibition, annually.

PITTSFIELD CAMERA CLUB.—Pittsfield, Mass. Organized 1892. *President*, A. N. French; *Secretary*, W. D. Goodwin, Pittsfield, Mass.

PORTLAND CAMERA CLUB.—Portland, Maine. Organized Feb. 6, 1890. *President*, Stanley P. Warren, M.D.; *Vice-President*, Nathan Clifford; *Executive Committee*, Franklin M. Lawrence, Wm. Sweat, F. H. Little, Harry Levy; *Lantern Slide Director*, Warren C. King; *Treasurer*, Clayton T. Whipple; *Librarian*, Frederick S. Bullard; *Secretary*, Frederick Fox, Jr., 66 Union Street, Portland, Me. Place of meeting, Rooms of Portland Society of Art. Ordinary meetings, first Tuesday of each month. Special meetings, whenever called by Secretary and President. Annual meeting. first Tuesday in February. Membership September 1: Honorary, 6; active, 48; total, 54. Exhibitions of lantern slides of both the New England and American Interchanges. No regular time is set for the exhibitions of photographic work done by the Club members.

PROVIDENCE CAMERA CLUB.—Swarts Building, 87 Weybosset Street, Providence, R. I. Organized September, 1883. Incorporated May, 1889. *President*, Charles A. Stoddard; *Vice-President*, J. Eliot Davison; *Executive Committee*, Charles A. Stoddard, R. Clinton Fuller, J. A. Miller, Jr., S. B. Burnham, W. A. Dean, E. A. Darling, Geo. W. Lake, A. W. Howe, E. Q. Gladding; *Treasurer*, E. A. Darling; *Librarian*, G. Edwin Sawin; *Recording Secretary*, S. B. Burnham; *Corresponding Secretary*, W. A. Dean, Custom House Street. Place of meeting, Swarts Building, 87 Weybosset Street. Ordinary meetings, first Tuesday in the month, 8 P.M. Special meetings at call of the President, generally one or two a month.

Annual meeting, first Tuesday in June. Membership September 1: Active, 75; associate, 11; total, 86. Our tables are supplied with all the leading publications. Annual exhibitions of all branches of photography. Lantern slides, one or two exhibitions each month, from November to May. Annual field days, May 30 and June 17.

PITTSBURGH AMATEUR PHOTOGRAPHERS' SOCIETY.—Academy of Science and Art. Organized 1886. *President*, W. S. Bell; *Vice-President*, W. S. Clow; *Executive Committee*, C. C. Craft, L. S. Clarke, O. H. Darlington, Horace Moorhead; *Treasurer*, Wm. J. Hunker; *Librarian*, George Heisey; *Secretary*, Jos. H. Hunter, 248 Centre Avenue, Pittsburgh, Pa. Place of meeting, Academy of Science and Art. Ordinary meetings, second Monday of each month. Special meetings, when called by the President or three members of Society. Annual meeting, April. Membership September 1: Honorary, 3; active, 67; total, 70.

PLAINFIELD CAMERA CLUB.—17 East Front Street, Plainfield, N. J. Organized June 7, 1888. Incorporated September 13, 1890. *President*, Oscar S. Teale; *Vice-President*, Geo. H. Babcock; *Board of Directors*, O. S. Teale, G. H. Babcock, Harold Serrell, H. H. Coward, Otto Arens, J. Hervey Doane; *Treasurer*, Harold Serrell; *Historian*, F. R. Stevens; *Secretary*, H. H. Coward, 79 East Front Street, Plainfield, N. J. Place of meeting, Club Rooms, 17 East Front Street. Ordinary meetings, first and third Tuesdays of each month. Special meetings on call of President. Annual meeting, third Tuesday in December. Membership September 1: Honorary, 3; active, 50; associate, 8; total, 61. Exhibitions, annual print exhibition held the last week in November.

POSTAL PHOTOGRAPHIC CLUB.—*President*, Randall Spaulding, Montclair, N. J.; *Treasurer*, F. E. Fairbanks, Fitchburg, Mass.; *Secretary*, F. E. Fairbanks, 11 Day Street, Fitchburg, Mass. Membership March 1: Active, 40; total, 40. Publications, one Album and its accompanying Note Book, each month.

QUEBEC CAMERA CLUB.—Organized March 7, 1887. Place of meeting at Capt. W. E. Imlah's quarters, the Citadel, Quebec, Province of Quebec, Canada. The annual meeting is held on the second Monday in December. *Vice-President*, Captain J. George Garneau; *Treasurer*, James Brodie; *Committee*, Captain W. E. Imlah, J. B. Amyot; *Secretary*, Captain Ernest F. Würtele.

RICHMOND CAMERA CLUB.—Richmond, Va. Organized 1890. *President*, E. F. C. Davis; *Secretary*, C. D. Habliston, 630 E. Main Street, Richmond, Va.

ROCHESTER, CAMERA CLUB OF.—62 State Street, Rochester, N. Y. Organized 1889. *President*, L. A. Weigel, M.D.; *Secretary*, Jonathan G. Meyer, 6 Anson Park, Rochester, N. Y.

SAN DIEGO CAMERA CLUB.—San Diego, Cal. *President*, J. Rodes; *Secretary*, W. W. Whitson, 1934 Fourth Street, San Diego, Cal.

SCHUYLKILL CAMERA CLUB.—Pottsville, Pa. Organized July 5, 1889. *President*, A. W. Sheafer; *Vice-President*, Miss Elena Roads; *Executive Committee*, A. W. Sheafer, Miss Roads, B. S. Simonds, W. L. Sheafer; *Treasurer*, W. L. Sheafer; *Librarian*, B. S. Simonds; *Secretary*, B. S. Simonds, "The Orchard," Pottsville,

Pa. Place of meeting, Sheafer Office Building, Centre Street. Ordinary meetings, last Friday of month, 8 P.M. Special meetings, call of President. Annual meeting, May. Membership September 1: Honorary, 10; active, 61; corresponding, 47; total, 118. Exhibitions, two per month, except July and August; regular exhibition in May. Member of American Lantern Interchange.

SPRINGFIELD CAMERA CLUB.—Springfield, Mass. *President*, Henry C. Haile; *Executive Committee*, Henry C. Haile, Chas. C. McElwain, Wm. M. Lester, L. C. Bolen, Wm. P. Draper; *Treasurer*, Wm. M. Lester; *Librarian*, L. C. Bolen; *Secretary*, Charles C. McElwain, P. O. Box, 1528 Springfield, Mass. Place of meeting, corner Main and Sanford Streets. Ordinary meetings, third Wednesday of each month, 7.30 P.M. Special meetings at call of Executive Committee. Annual meeting, third Wednesday in October. Membership September 1: Honorary, 4; active, 51; total, 55. Exhibitions: Print exhibition in fall.

ST. LOUIS CAMERA CLUB.—St. Louis, Mo. *President*, W. Mulford; *Secretary*, J. F. Hickman, 908 Wainwright Building, St. Louis, Mo.

ST. PAUL CAMERA CLUB.—14 E. 3d Street, St. Paul, Minn. Organized March 13, 1893. *President*, James Paris; *Vice-President*, D. F. Brown; *Board of Directors*, E. F. Zimmerman, A. M. P. Cowley, C. H. Buckley, J. C. Jensen, W. A. Russell, Lern Campbell, and the four officers; *Treasurer*, W. B. Thorne; *Secretary*, W. J. Sonnen, with St. Paul Fire and Marine Insurance Co., 3d and Jackson Streets, St. Paul, Minn. Place of meeting, No. 14 E. 3d Street. Ordinary meetings, every Friday evening. Annual meeting, second Tuesday in March. Membership September 1: Honorary, 1; active, 29; total, 30. Exhibitions: Give a stereopticon exhibition of work done by members and others about once a month. Will try and belong to the Lantern Slide Exchange for the season of 1894–'95 if possible.

SYRACUSE CAMERA CLUB.—Organized 1886; incorporated January, 1892. *President*, Amos Padgham; *Vice-President*, Geo. Timmins; *Directors*, Amos Padgham, George Timmins, Herbert F. Smith, E. C. Howe, E. H. Burdick, Fred. Frazer, J. R. Clancy and J. D. Pennock; *Lantern Slide Director*, Will H. Olmsted; *Treasurer*, Edward C. Howe; *Secretary*, Herbert F. Smith, 1316 Spring Street, Syracuse, N. Y. Place of meeting, 322 South Salina Street, Syracuse, N. Y. Ordinary meetings, every Friday evening at 8 o'clock. Annual meeting, first Friday evening in January. Membership, September 1: Active, 80; associate, 12; total, 92. Club outings May and October in each year. Public Slide exhibitions in March each year. Print exhibitions occasionally.

"TECH" CAMERA CLUB.—Boynton Hall, Worcester Polytechnical Institute. Organized September 28, 1889. *President*, Edw. H. Keith; *Vice-President*, Henry N. Smith; *Executive Committee*, President, Treasurer, Keeper, Secretary and H. F. Walker; *Treasurer*, Edw. W. Vaill, Jr.; *Keeper*, Louis de V. Magaw: *Secretary*, Henry J. Fuller, Boynton Hall, Worcester Polytechnical Institute. Place of meeting, Boynton Hall. Ordinary meetings, second and fourth Saturday evenings each month. Special meetings at call of Secretary. Annual meeting, in June, at call of President. Membership September 1: Honorary, 6; active, 14; corresponding, 10; total, 30. Exhibitions, first week in January exhibit of prints; lantern exhibits January and April.

TOLEDO CAMERA CLUB, THE.—Toledo, O. Organized December 3, 1890. *President*, F. C. Wade; *Vice-President*, Rev. C. Scodding; *Executive Committee*, F. C. Wade, Rev. C. Scodding, C. H. Walbridge, H. J. Colburn and M. A. Martin; *Treasurer*, M. A. Martin; *Librarian*, E. M. Harter; *Secretary*, M. A. Martin, 602 Summit Street, Toledo, O, Place of meeting, Club Rooms, Sheridan Block. Ordinary meetings, first Monday in every month. Special meetings, called by President. Annual meeting, first Monday in December. Membership September 1: Honorary, 4; active, 50; total, 54. Exhibitions, annual, second week in January. Lantern slide exhibitions given nearly every monthly meeting.

TORONTO CAMERA CLUB, THE.—Corner Yonge and Gerrard Streets, Toronto, Canada. Organized March, 1887. Incorporated January 19, 1893. *President*, A. W. Croil; *First Vice-President*, W. H. Moss; *Second Vice-President*, Geo. H. Gooderham; *Executive Committee*, Hugh Neilson, J. G. Ramsey, E. E. King, M.D., E. H. Walsh, G. R. Baker, R. G. Muntz; *Treasurer*, Ernest M. Lake; *Secretary*, Ernest M. Lake, 17 Jordan Street, Toronto. Place of meeting, second floor, corner Gerrard and Yonge Streets. Ordinary meetings, Mondays, from October to April, 8 P.M. First Monday in each month is "Club Night," when rooms open to friends of members and lantern entertainment is given. Annual meeting, first Monday in November. Membership September 1: Honorary, 3; active, 125; non-resident, 6; total, 134. Exhibitions held annually in February or March. Third annual exhibition held February 19 to 24, 1894. Exhibitions open to all amateurs.

UNIVERSITY CAMERA CLUB.—Lincoln, Neb. Organized January 9, 1892. *President*, H. A. Senter; *Vice-President*, R. S. Hiltner; *Executive Committee*, H. A. Senter, R. S. Hiltner, Rosa Bouton, Mariel Gere, Prof. E. H. Barbour; *Secretary*, Rosa Bouton, University of Nebraska, Lincoln, Neb. Place of meeting, Room 4, Chemical Laboratory. Ordinary meetings, first Tuesday of each month, 8 P.M. Special meetings, called by Executive Committee. Annual meeting, May meeting. Membership September 1: Honorary, 2; active, 23; corresponding, 2; total, 27. Exhibitions, the annual exhibit is held in Chemical Laboratory on Tuesday of commencement week,

UTICA CAMERA CLUB, THE.—Utica, N. Y. *President*, W. C. Walker; *Secretary*, Harry Lancaster; *Treasurer*, W. W. Nicholson. The Club has secured rooms and these are being furnished for the use of the Club, Membership, 35.

WATERBURY, PHOTOGRAPHIC SOCIETY OF.—Organized May, 1888. *President*, H. W. Hayden; *Vice-President*, H. T. Steadman; *Executive Committee*, Frank Welton, Fred. Root, H. G. Filley, Mrs. H. T. Steadman, Miss Alice Depew; *Treasurer*, E. W. Mooring; *Secretary*, C. R. Russell, 44 Grove Street, Waterbury, Conn. Place of meeting, Brown's Block, South Main Street. Ordinary meetings, first and third Tuesdays of each month. Membership September 1: Active, 66. Exhibitions, every two weeks.

WATERTOWN CAMERA CLUB.—Watertown, N. Y. *President*, A. R. Wilson; *Secretary*, C. A. Wilson, 212 Public Square, Watertown, N. Y.

WINNIPEG CAMERA CLUB.—Winnipeg, Manitoba, Canada. *President*, L. A. Nares. *Secretary*, A. E. Ferte, City Hall, Winnipeg, Manitoba, Canada.

WORCESTER CAMERA CLUB.—Worcester, Mass. *President*, A. M. Powell; *Secretary*, A. H. Chaffee, 492 Main Street, Worcester, Mass.

FOREIGN PHOTOGRAPHIC SOCIETIES.

GREAT BRITAIN AND IRELAND.

ABERDEENSHIRE AMATEUR PHOTOGRAPHIC SOCIETY.—Hon. Secretaries, G. Brodie and James Milne, 26 Broad Street, Aberdeen.

ABNEY CAMERA CLUB.—Hon. Secretary, F. H. Leeds, F.I.C., F.C.S., 26 East Bank, Stamford Hill, London, N.

ACCRINGTON AND DISTRICT CAMERA CLUB.—Hon. Secretary, Isaac Hanson, Rothwell Heights, Accrington.

AINTREE SOCIETY OF PHOTOGRAPHERS.—Secretary, C. S. Adkins, 28 Avrell Lane, Aintree, near Liverpool.

ALDENHAM INSTITUTE CAMERA CLUB.—Hon. Secretary, E. Pringle, Aldenham Institute, Goldington Crescent, Pancras Road, London, N. W.

AMATEUR PHOTOGRAPHIC ASSOCIATION.—Secretary, Arthur James Melhuish. Office, 58 Pall Mall, London, S. W.

AMATEUR PHOTOGRAPHIC RESEARCH CAMERA CLUB.—Secretary, J. C. N. Davidson, Windsor Park, Belfast, Ireland.

ARBROATH AMATEUR PHOTOGRAPHIC ASSOCIATION.—Hon. Secretary, J. Hood, 94 High Street, Arbroath.

ASHTON-UNDER-LYNE PHOTOGRAPHIC SOCIETY.—Hon. Secretary, Robt. T. Marsland, 24 Park Parade, Ashton-under-Lyne.

ASTON NATURAL HISTORY AND PHOTOGRAPHIC SOCIETY (PHOTO SECTION).—Hon. Secretary, F. W. Pilditch, 133 Wills Street, Lozells.

AYLESBURY AMATEUR PHOTOGRAPHIC SOCIETY.—Hon. Secretary, J. F. Roche, 2 St. Mary's Square, Aylesbury.

BATLEY PHOTOGRAPHIC SOCIETY.—Secretary, A. S. Fox, Springfield Villa, Batley,

BATH PHOTOGRAPHIC SOCIETY.—Secretary and Treasurer, W. Middleton Ashman, 12A Old Bond Street, Bath.

BEDFORD AND DISTRICT CAMERA CLUB.—Hon. Treasurer and Secretary, W. E. Ison, Hughenden, River Crescent, Bedford.

BELFAST Y. M. C. A. CAMERA CLUB.—Secretary, James McCleery, 14 Wellington Place, Belfast, Ireland.

BEVERLEY PHOTOGRAPHIC SOCIETY.—Secretary, T. J. Morley, Toll Gavel, Beverley, East York.

BIRKENHEAD PHOTOGRAPHIC ASSOCIATION.—Hon. Secretary, C. Male, 28 Grange Mount, Birkenhead.

BIRMINGHAM PHOTOGRAPHIC SOCIETY.—Secretary, C. J. Fowler, Court Mount, Erdington.

BLACKHEATH CAMERA CLUB.—Hon. Secretary, S. B. Earle, Burnt Ash Hill, Lee, S. E.

BOLTON PHOTOGRAPHIC SOCIETY.—Secretary, C. K. Dalton, 50 Higher Bridge Street, Bolton.

BORDER AMATEUR PHOTOGRAPHIC ASSOCIATION.—Hon. Treasurer and Secretary, B. Cartright, 50 High Street, Galashiels, N. B.

BOURNEMOUTH SCIENTIFIC AND ANTIQUARIAN SOCIETY (PHOTOGRAPHIC SECTION).—Hon. Secretary, E. Greenleaves, Priory Mansions, Bath Road, Bournemouth.

"BOYS' OWN" POSTAL PHOTOGRAPHIC CLUB.—Hon. Secretary, J. E. Hardwich, 7 Belford Terrace, Sunderland.

BRADFORD PHOTOGRAPHIC SOCIETY.—Hon. Secretary, T. P. Burgess, 16 Whitley Grove, Bradford.

BRECHIN PHOTOGRAPHIC ASSOCIATION.—Secretary, James D. Ross, 6 High Street, Brechin, N. B.

BRIGHOUSE PHOTOGRAPHIC SOCIETY.—Hon. Secretary, F. Moore Cardwell, Telephone Office, Huddersfield Road, Brighouse.

BRIGHTON AND SUSSEX NATURAL HISTORY AND PHILOSOPHICAL SOCIETY (PHOTOGRAPHIC SECTION).—Hon. Secretary, G. Foxall, Woodlands, Port Hall Road, Brighton.

BRISTOL AND WEST OF ENGLAND AMATEUR PHOTOGRAPHIC ASSOCIATION.—Hon. Secretary, E. Brightman Tyndale, Redland Road.

BRISTOL CAMERA SOCIETY.—Hon. Secretary, E. R. Jakeways, Hope Villa, St. Mark's Road, Bristol.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—Burlington House, London, W. Secretary, G. Griffiths, M.A., College Road, Harrow. Annual meeting at Ipswich, 1895.

BRIXTON AND CLAPHAM CAMERA CLUB.—Hon. Secretary, B. E. Pinder, 7 McDowall Road, Camberwell, S. E.

BURNLEY PHOTOGRAPHIC SOCIETY.—Hon. Secretary, Jesse L. Altham, Bank Chambers, Burnley.

BURTON-ON-TRENT NATURAL HISTORY SOCIETY (PHOTOGRAPHIC SECTION).—Hon. Treasurer and Secretary, R. M. Blackburn, 58 Blackpool Street, Burton.

BURY PHOTOGRAPHIC AND ARTS CLUB.—Secretary, Roger Wood, 11 Bolton Street, Bury, Lancashire.

CAMERA & CO.—Hon. Treasurer and Secretary, Albert Forrest, 14 Market Street, Pontypridd.

CAMERA CLUB.—Charing Cross Road, London. Secretary, C. G. Murrell, M.A., Camera Club, Charing Cross Road, London.

CARDIFF PHOTOGRAPHIC SOCIETY.—Hon. Secretaries, G. H. Bedford and T. H. Faulks, 127 Bute Road, Cardiff.

CARLISLE AND COUNTY AMATEUR PHOTOGRAPHIC SOCIETY.—Hon. Secretary, John S. Atkinson, 55 South Pettrel Street, Carlisle.

CENTRAL PHOTOGRAPHIC CLUB.—Hon. Secretaries, W. Fenton Jones, 12 King Edward Road, Hackney, N.E., and C. H. Oakden, 51 Melbourne Grove, East, Dulwich, S.E.

CHARITABLE LANTERN ENTERTAINING SOCIETY.—Joint Hon. Treasurers and Secretaries, Frank Simmons, 158 Frances Terrace, Herne Hill, S.E., and B. Foulkes Winks, 2 Pretoria Avenue, Walthamstow.

CHELTENHAM AMATEUR PHOTOGRAPHIC SOCIETY.—Hon. Treasurer and Secretary, Philip Thomas, The College Pharmacy, Cheltenham.

CHESTER SOCIETY OF NATURAL SCIENCE AND LITERATURE (PHOTOGRAPHIC SECTION).—Hon. Treasurer and Secretary, J. H. Spencer, 36 Bridge Street, Chester.

CHORLEY PHOTOGRAPHIC AND SKETCHING CLUB.—Hon. Secretary, Thos. Brindle, 62 Market Street, Chorley.

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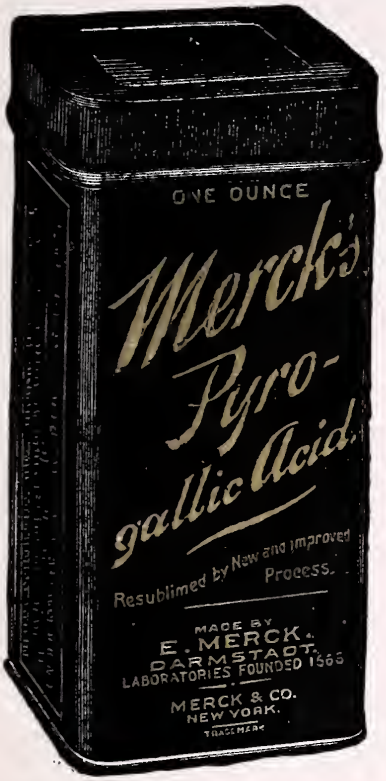
Wyeth's Compressed Tablets of Photo Chemicals..... 47

Zinc, Copper and Brass Plates..... 75

Merck's Pyrogallic Acid



will be found, upon comparison, to be superior in every respect to all other brands on the market. Its distinctive points of superiority are:

1st.—ABSOLUTE PURITY

2d.—PERFECT CRYSTALLIZATION

3d.—IMMACULATE WHITENESS

4th.—EXTREME LIGHTNESS

5th.—MODERATE COST
(Its price is not higher than that of any other make.)

Merck's Pyrogallic Acid

produces the highest intensity to be desired in a photographic plate, and, at the same time, the finest detail in light and shade required for the most perfect printing negative.

Under ordinary precaution, it retains all its superior qualities undiminished for an indefinite length of time.

☞ WHEN ORDERING SPECIFY **"MERCK'S."**

TO BE HAD OF ALL DEALERS.

(OVER)

TESTIMONIALS.

"I have tested Merck's pyro carefully in comparison with the other pyros at present on the market, and I find that it is superior to any and all of them."

Prof. CHARLES EHRMANN,
Instructor of the Chautauqua School of Photography.

"I shall, in future, certainly use no other pyro but Merck's. The best is always good enough for me."

ALFRED STIEGLITZ,
Editor *American Amateur Photographer.*

"Merck's Pyrogallic Acid will be found a very superior article. Its purity is absolute, with quick crystallization and immaculate whiteness. In use, it produces the highest intensity that can be desired in the negatives. The detail in light and shade is perfect, producing printing qualities unsurpassed by any pyro we have ever used."

ST. LOUIS AND CANADIAN PHOTOGRAPHER.

"Merck's pyro has undergone a severe test in my hands. I find it to possess many qualities which give it superiority over all other makes. Authorities place the solubility of pyro as one part in two of water. I found one ounce of Merck's to dissolve readily in 1:7 of water at 60°. It is extremely light, pure, and of a fine white color, giving rich negatives full of vigor and sparkling brilliancy."

WALTER E. WOODBURY,
Editor of *The Photographic Times.*

"I have used Merck's Pyrogallic Acid, and prefer it to all others."

B. W. KILBURN,
Official Photographer (Stereoscopic), at the Columbian World's Fair, and San Francisco Mid-Winter Exposition.

"I have tried Merck's pyro and must certainly say it is the best I ever used. The results I have obtained with it are remarkably fine."

W. B. POST,
Amateur Photographer, New York.

MORENO STUDIO, Fifth Ave., New York.

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A. MORENO.

"I have been using Merck's pyro, and am ready to indorse the high praise which you have found it entitled to: 'that it is superior in point of purity, lightness and solubility' to any like product that I have seen. In fact, 'the new and improved process' seems to reach in its result the point beyond which it is impossible to go—that is, perfection. This was my impression at first sight, and using serves only to confirm it.

In my opinion, pyro stands at the head of all developers of dry plates, and I am much mistaken if Merck's pyro, when known, does not lead all brands of pyro."

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IS neither CURLY nor HORNY, neither STICKY nor SOFT, but has a **rubber-like film,** which stands a hot water test of 100 degs. F. and behaves just as well in ice cold water. **No Alum** nor special hardening baths which endanger the durability of the image. **No Ice, no Hot Water** treatment, no special negatives required. **Permanent Prints. A paper for all climates and all seasons.**

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Mat Surface with Platinum effects. For Contact prints and enlargements. Can be toned Sepia. Printed in a few seconds.

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A thoroughly first-class paper for crayon work, giving good blacks, pure whites and half-tones.

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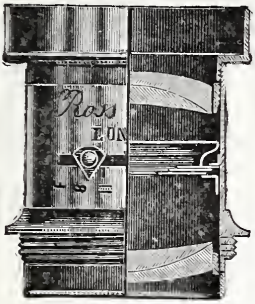

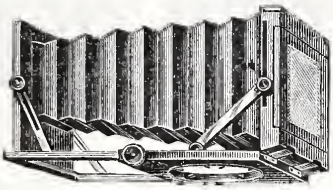

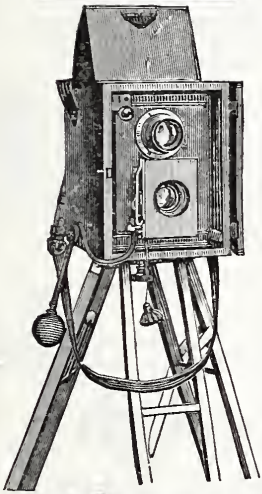

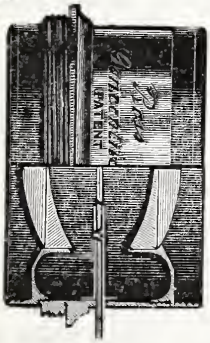

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A new printing-out paper that gives tones similar to Platinum, with **absolutely mat surface.**

Superior results with simple and easy manipulation.

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Approved: John Boyd Thacher
Chairman Executive Committee on Awards.

Copyist M.M.L. *Date* March 24, 1894.

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Dry Plates and Films.

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FOR THE STUDIO and INSTANTANEOUS EXPOSURES.

Always Reliable and Uniform.

ORTHOCHROMATIC

For Artistic Photography In the Studio or the Field.

Made in Three Rapidities:

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Sens. 23. Slow, used for copying paintings and all still life in which color predominates; is a splendid plate for landscape containing distant mountain vistas.

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Unequaled for easy manipulation and brilliancy of results. See letter from Secretary of N. E. LANTERN SLIDE EXCHANGE, on page 22.

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I have just developed the six 24 x 36 COLUMBIAN ANTI-HALATION PLATES and cannot express too strongly my appreciation of the value of the COLUMBIAN BACKING. You have certainly placed a boon in the hands of the photographer, whose work is often marred by intense halation.

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Carbutt's Keystone

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MR. JOHN CARBUTT:

Finding the keeping of gelatine dry plates very disappointing in a warm, damp climate like this, I determined to put some to the test without adopting special precautions. The result, so far as *your* plates are concerned, is so satisfactory that I have thought it would interest you to know it. A box of your ORTHO sens. 27, gave excellent results after being kept seven months, and I have just used a box of your ORTHO sens. 23, after keeping them TEN months, and though developed with Pyro, they give results in every way satisfactory. I am, sir,

Yours very truly,

C. H. EYLES, Colonial Surgeon.

NEW YORK, May 23d, 1894.

MR. JOHN CARBUTT:

* * * With reference to your EIKO cum HYDRO Developer, would say that I have attained results with the same that are unsurpassed by any developing agencies known to art. I have been able to play the changes on it the same as with Pyro, with the difference that most of the evils that beset Pyro development are absent. One of the leading photo dealers down here on Broadway has put in a stock of it on my suggestion, and it is giving universal satisfaction to his patrons.

Very truly yours,

E. W * * * *

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MR. JOHN CARBUTT:

Having recorded the different makes of Lantern Slide plates that appeared in the New England Exchange the past year, I thought it might interest you to know that out of **598** named plates **509** are of your make, showing the popularity of your plates throughout New England.

Very truly yours,

R. CLINTON FULLER,
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MR. JOHN CARBUTT:

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Yours sincerely,

R. M. FULLER,
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Carbutt's Dry Plates and Flexible Films are to be obtained from all dealers in Photo Materials.
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Keystone Dry Plate and Film Works.

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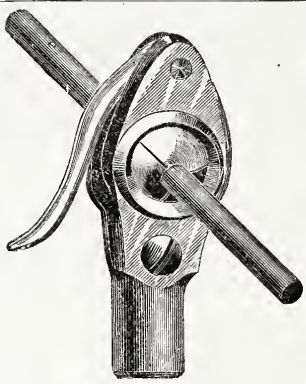

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[Signed,] WM. H. THORNE, *Chairman Sub-Committee.*

THOS. P. CONRAD, W. M. MCALLISTER,
D. E. CROSBY, LOUIS H. SPELLIER,
C. CHABOT.

Medal and Diploma at Wiesbaden by the German Society of Photographers, 1891.
Highest Distinction, Geneva, Switzerland, 1893.

Five Awards, World's Columbian Exposition, Chicago, 1893.

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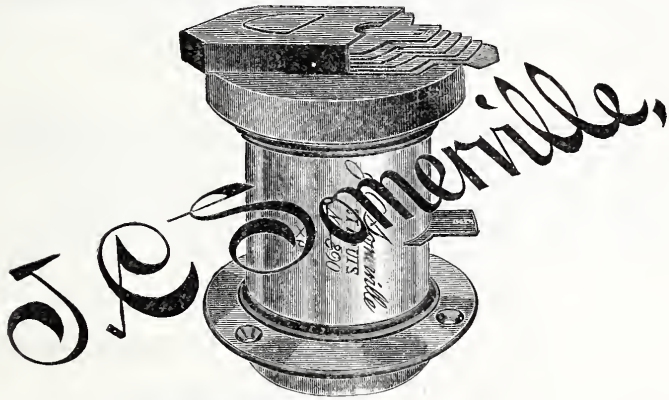

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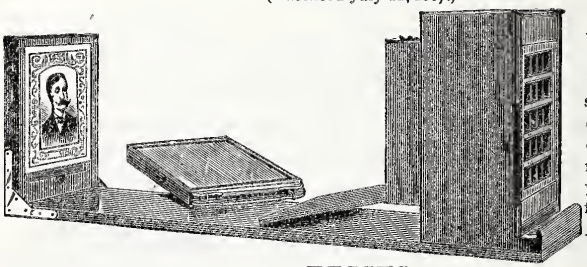

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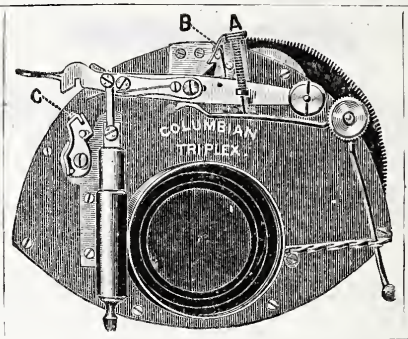

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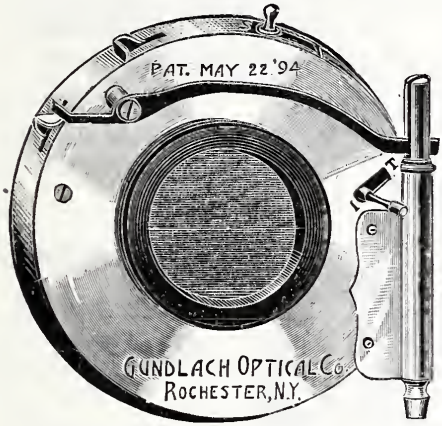

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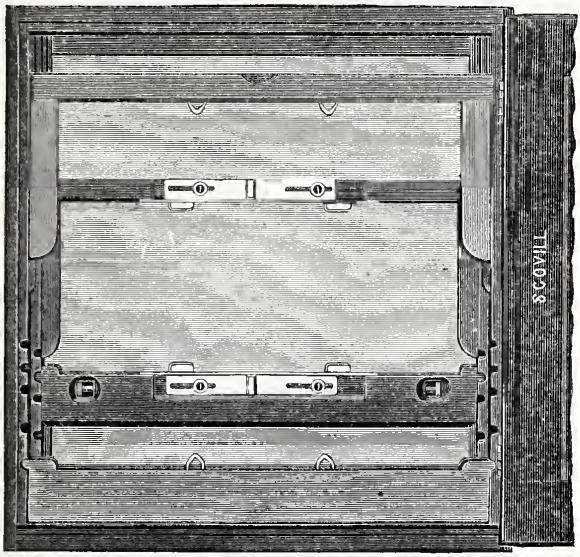

[Patent applied for.]

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		Frames *only:* for Ground Glass.
8 x 10 Size	$15 50	$1 50
10 x 12 "	21 00	1 50
11 x 14 "	26 50	1 88
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An outside attachment for adjusting the screen plate holder when the holder is closed, can be added when desired, at an additional cost of Two Dollars.

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No. 2. DEVELOPING—SODA.
(Composed of Sulphite of Soda, Carb. Soda and Carb. Potash.)

Nos. 1 and 2 when mixed, as directed on the label, constitute the "Developing Solution," or, as sometimes called, "Developer."

No. 3. FIXING AND CLEARING.
(Composed of Sulphite of Soda, Acid Citric, Chrome Alum.)

No. 4. FIXING AND CLEARING.
(Consists of Hyposulphite of Soda.)

Nos. 3 and 4, when mixed, according to instructions on the label, make the Fixing and Clearing Bath, which can be kept for stock solution if so desired.

No. 5. TONING FOR PRINTS—GOLD CHLORIDE.
No. 6. TONING FOR PRINTS—SODA.
Nos. 5 and 6 constitute the Toning Bath; this must be alkaline.

No. 7. PRINT FIXING—HYPOSULPHITE OF SODA.
This can also be used advantageously for stock solution, a few drops of Aqua Ammonia greatly enhancing its value.

No. 8. BROMIDE OF POTASH.
For checking the too rapid development of over-exposed plates.

Any of the above Tablets can also be procured separately.

Price for Complete Equipment, $3.00.

The **Developing Outfit** containing the following Tablets, with full instructions on each bottle for preparing the solutions:

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No. 2. DEVELOPING—SODA.
(Composed of Sulphite of Soda, Carb. Soda and Carb. Potash.)

No. 3. FIXING AND CLEARING.
(Composed of Sulphite of Soda, Acid Citric and Chrome Alum.)

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Our Nos. 1 and 2 Developing Tablets are so prepared that those who are in the habit of immersing the plates with Pyro solution first and then adding the Soda, can do so. Our formulas Nos. 3 and 4, for Fixing and Clearing, are of such combination that we dispense entirely with the Alum Bath, thus requiring only two trays to develop and fix the plate.

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Nos. 5 and 6 constitute the Toning Bath; this must be alkaline.

No. 7. PRINT FIXING—HYPOSULPHITE OF SODA.
This can also be used advantageously for stock solution, a few drops of Aqua Ammonia greatly enhancing its value.

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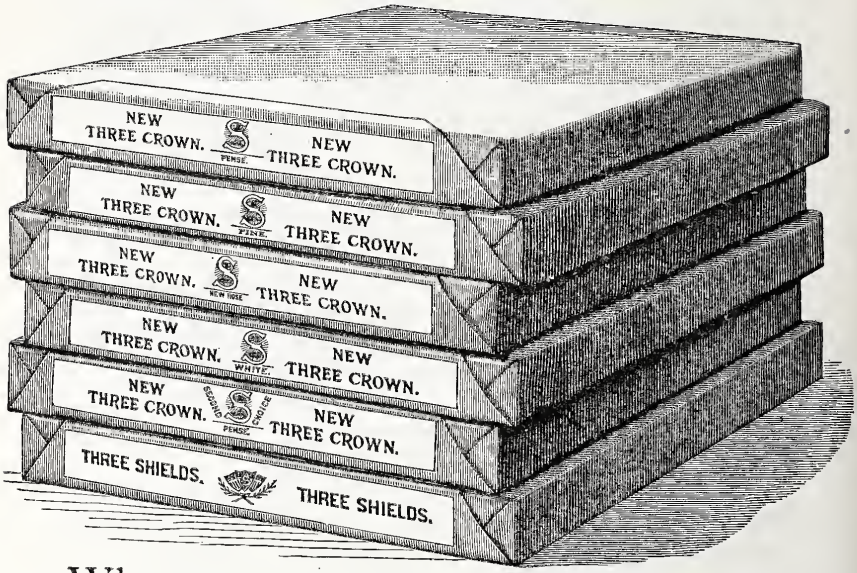

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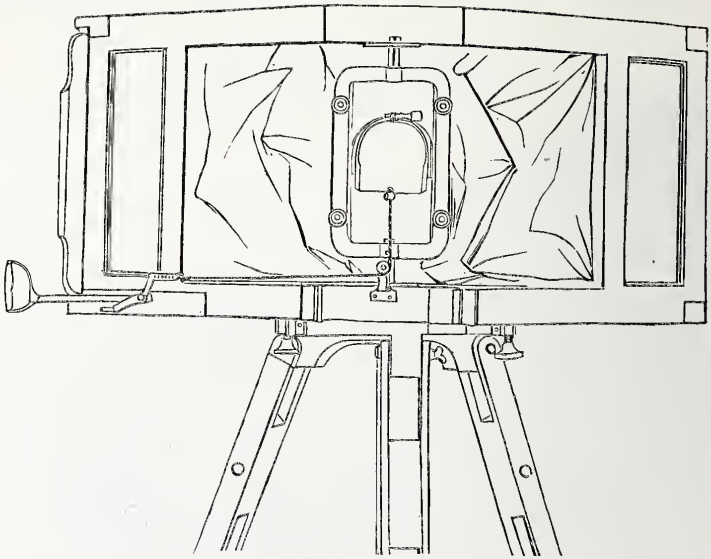
PHILADELPHIA.

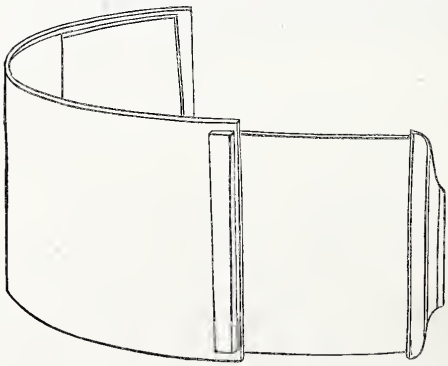
The Scovill Panoramic Camera.



WE take pleasure in introducing to the photographic fraternity our new Panoramic Camera, which is made in various dimensions up to the size capable of making photographs 18 x 48 inches.

A new design of constructing these cameras in hemispherical form has been invented; a new movement of crossing the lens over the segments of the circle, and an automatic release for the shutter has also been constructed. Carbutt's No. 27 films, or his orthochromatic films of the same sensitiveness, are used by means of an ingeniously constructed flexible dark slide, which permits of the necessary curve to conform with the back of the camera. The cameras are solidly and serviceably made, elegant in finish, and in every way maintain the world-wide reputation of the American Optical Company. The cuts shown herewith give an idea of the external appearance of the camera, and the dark slide for holding the film.

The prices of these cameras, including in each case a substantial wooden box or trunk for holding the instrument, a suitable tripod, a panoramic printing frame, two holders, two developing baths, and the celebrated Swift lens, are given below.



Price of The Scovill Panoramic Outfit for making photographs 10x30 inches, complete as above, " " " " $250

Price of The Scovill Panoramic Outfit for making photographs 16x43 inches, complete as above, " " " " 300

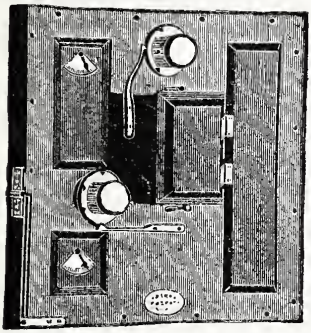
THE

SCOVILL & ADAMS COMPANY,

423 Broome Street,

New York City.

KLAY'S MULTIPLYING PLATE HOLDER.



THE LATEST and Most Ingenious Novelty devised for the Photographer's use. It is a Holder which can be attached to any 8x10 Camera or larger. By its use from 1 to 28 pictures can be obtained on the same plate in a few minutes. The pictures can be all alike or 28 different positions if desired at a single sitting. Each Holder has 2 Register Plates which will enable the operator to tell the number of impressions taken. One of the leading features of the Holder is that it dispenses with the drawing of holder slides as commonly used on other holders; in short, it is the perfection of convenience and simplicity, and an indispensable article in the studio.

Prices for Holder will be quoted upon application.

The public is warned against the manufacture, sale, or use of any device that infringes on our patent.

SEND TEN CENTS FOR SAMPLE PICTURES.

The Single Lens Multiplying Plate Holder Co. (Limited),

BLUFFTON, ALLEN COUNTY, OHIO.

The Air Brush Mfg. Co.

IS STILL DOING BUSINESS AT THE OLD STAND.

All tradesmen are preparing for the season's work by getting the best tools to be ready to do the best work of any in their line.

The artist, too, who has a business idea, as all people should have, is looking forward to meet the competition in trade.

The first thing is the outfit, and the knowledge to use it.

The best art tool in use for the best work is the Air Brush made by the above named firm. There are numerous imitations offered, some widely advertised, and many of the curious have tried them and put them aside and come back to their first love, and now say more than ever for the Air Brush.

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AIR BRUSH MANUFACTURING CO.,

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HAMMER DRY PLATES!

BECAUSE THEY ARE

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Reproductions of OIL PAINTINGS, WATER COLORS AND PASTELS RENDERED IN THEIR TRUE COLOR VALUES BY THE ORTHOCHROMATIC PROCESS. ENGRAVINGS, ETCHINGS AND PHOTOGRAPHS REPRODUCED, ENLARGED OR REDUCED.

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Reproductions of Works of Foreign and Domestic Artists on Sale.

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satisfy you when you send 5 cents in stamps for a sample of our **SPECIAL BLUE PAPER,** we will refund the money and you may keep the paper to boot. It is absolutely the best thing of its kind in the market. **Fresh every day.** 25c. per yard (27 inches wide), cut to any size, and sent by post prepaid.

AS IS WELL KNOWN

we carry a full line of CAMERAS, DRY PLATES, FILMS and SUPPLIES. Everything fresh and up to date. Two Dark Rooms.

Agents for: KODAKS, $6.00 to $75.00; PREMOS, $30.00 to $38.00; PREMIERS, $15.00 to $34.00; POCOS, $25.00 to $32.00; HAWKEYES, $15.00 to $60.00; BULL'S EYES, $8.00 to $15.00; NIGHT-HAWKS, $5.00. Special Agents for the PLATINOTYPE PAPER.

A one-cent stamp will elicit the prompt return of a Special Catalogue on any one of the above, or our "Booklet of Good Things."

THE OBRIG CAMERA CO.

Near Cortlandt Street, **163 BROADWAY, N. Y.**

ABSOLUTELY PURE.

We have at last obtained a Photo Blotting Paper (THE ALBION) which is absolutely chemically pure. It is a very different article from ordinary blotting paper, which always contains more or less impurities that are injurious to photographic prints. This paper may be used in the most delicate photographic operations with perfect safety. We had it especially made for photographers' purposes, and can unhesitatingly recommend it.

Price per Half Ream, - - - $12 00
" " Dozen Sheets, - - - 72

ASK YOUR DEALER FOR

ALBION (100 lb.) PHOTO BLOTTING PAPER.

THE SCOVILL & ADAMS CO., Sole Importers.

A

Camera Box, made by the

American Optical Company

over thirty years ago, is now in use by the United States Government (Treasury Department). What a testimonial!

WM. P. BRIGDEN,

ARCHITECTS' PERSPECTIVES

General Designer and Book Illustrator,

In Pen-and-Ink and Water Colors.

No. 4 Warren Street, New York City.

Our Celebrated Walpole Hypo.
(*Regular "Old Style" Large Crystals.*)

"New Process Walpole Hypo."
Trade Mark.
PUREST HYPO MADE.

Pure Walpole Sulphite Soda.

Products Unsurpassed.

ACETIC ACID,
ACETATE OF LEAD,
ACETATE OF SODA,
ALUM POTASH,
ALUM CHROME,
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COPPERAS,
IRON SULPHATE,
OXALATE POTASH,
POTASH CARBONATE,
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Produce Fine Negatives.

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Book on "Hypo" free. **Photos** Exquisite.

☞ We do not solicit retail trade. Where consumers cannot obtain our products from their usual sources of supply, we will furnish them on application; but it must be understood that in these cases we charge the full retail prices, and that cash must accompany the order.

Send 5 cents (stamps) for each sample or 25 cents (stamps) for 6 samples.

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Walpole, Mass.

NEW AND GOOD!

: Merck's Superior Pyro.
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TRY THEM. FOR SALE BY ALL DEALERS.

The American Dry Plate Co.,

MANUFACTURERS OF THE WELL-KNOWN

AMERICAN DRY PLATES.

All grades of speed. From the slow plates for landscape work and copying to the fastest plates for portrait work. Ask your dealers for them and if they do not have them in stock, write to us and we will advise you where they can be purchased.

THE ARGENTIC PLATES ARE A SUCCESS!

No bath required. Will dry over a flame. Give excellent results if handled properly. Do not fail to try them and then you can see for yourself what they are. Manufactured only by

The American Dry Plate Co.,
WORCESTER, MASS., U. S. A.

THE PLATINOTYPE,

(COLD BATH.)

The BEST PROCESS for ARTISTIC EFFECTS.

A Sample Package of Paper and Developer costs 25c.

Send for Illustrated Pamphlet to

WILLIS & CLEMENTS,

1624 Chestnut St., PHILADELPHIA.

Another Power.

"I have put the

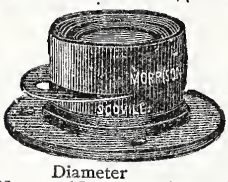
Swift Lenses

through hard, and they please me very much. They are another power that I gladly welcome. * * * * I would not part with them for double their cost."

B W. Kilburn, Littleton, N. H.

THE MORRISON

WIDE-ANGLE VIEW LENSES.



These Lenses are absolutely rectilinear; they are the most rapid, and are universally conceded to be the BEST WIDE-ANGLE LENSES MADE.

No.	Diameter of Lens.	Size of Plate.	Equivalent Focus.	Price.	
0	1 inch	$3\frac{1}{4}$ x $2\frac{1}{4}$ inch		$20 00	
3	1 "	$4\frac{1}{6}$ x $4\frac{1}{4}$ "		25 00	
4	1 "	5 x 8 "	$5\frac{1}{4}$ inch, each,	25 00	These 3 sizes will fit into 1 flange.
5	1 "	$6\frac{1}{2}$ x 8 "	$6\frac{1}{2}$ " "	25 00	
6	1 "	8 x 10 "	8 " "	30 00	
7	$1\frac{1}{4}$ "	11 x 14 "	$10\frac{1}{2}$ " "	40 00	These 2 sizes will fit into 1 flange.
8	$1\frac{1}{4}$ "	14 x 17 "	14 " "	50 00	
9	$1\frac{1}{2}$ "	17 x 20 "	17 " "	60 00	These 3 sizes will fit into 1 flange.
10	$1\frac{1}{2}$ "	20 x 24 "	22 " "	80 00	
11	$1\frac{1}{2}$ "	25 x 30 "	28 " "	100 00	

☞ Nos. 1 to 6 are all made in matched pairs for stereoscopic work. The shorter focused Lenses are especially adapted for street and other views in confined situations. For general purposes, a pair of No. 5 Lenses will be found most useful.

For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.

Remember

Reifschneider's superb Albums, the "Eclipse," and Reifschneider's "Non-Cockle," can always be found at

THE SCOVILL & ADAMS COMPANY,

423 Broome Street, N. Y.

— THE —

AMERICAN OPTICAL COMPANY'S

APPARATUS,

Either for Studio use or for Out-door Photography,

HAS NEVER BEEN EXCELLED OR EVEN EQUALLED

In Variety of Design, Durability of Construction, and in Fineness of Finish.

The Boston Imperial Camera is now the most popular of the numerous styles of Studio Cameras.

Of the View Cameras, the Irving and Star Reversible Back-View Cameras and the Revolving Back-View Cameras are the most popular.

In Hand Cameras and Amateur Outfits, the styles are so numerous that the latest catalogue must be consulted to get a fair idea of them.

The American Optical Company's Apparatus

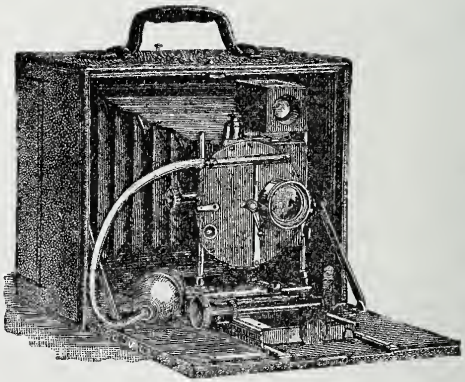
Is sold by all the leading photographic merchants in this country, Canada, West Indies, South America, Australia, Great Britain, Russia, Mexico, and in many other parts of the globe. Consult the latest descriptive catalogue; it is sent without charge by

THE SCOVILL & ADAMS COMPANY,

423 Broome Street, New York.

THE HENRY CLAY CAMERA.

This is the only Double-Shifting and Swing-Front Hand Camera.



The case is leather-covered, and when closed there is no finder visible, or openings elsewhere, to indicate that the Camera mechanism is concealed inside.

To open the Camera, press on the knob visible on the front, thus allowing the front to slide and then swing under the bottom of the Camera. The platform or bed of the Camera is carried with this board, and, by turning the wheel, the bed is made perfectly rigid. It will at once be apparent how the front may be racked outward until the front end of it is over the lines which indicate the focus for various distances. The figure 60 on the focusing scale indicates the focus for 60 feet or beyond. The finder of the Camera is now placed on the top of the front board, and is therefore always at the same angle as the lens; the finder is a reversible one, which may be turned when the Camera is fastened to a tripod, or is held, not with the handle upward, but with the handle on the side, in order to secure a vertical instead of a horizontal view. The front board is arranged to slide upward when taking a tall building, church spire, or any high object, and it is also arranged to swing, to still further aid in that endeavor.

By an ingenious arrangement the swing and vertical sliding adjustments may be made to work when the Camera is turned over and used horizontally.

One of the advantages of this Camera, when used in the hand, is in the taking of street scenes from an elevated position and having the lines of the building straight, while the subjects taken may be near by.

On the same principle, objects situated above the Camera level may be taken by reversing the position of lens and finder.

PRICE.

5 x 7 Henry Clay Camera complete, with Instantaneous Lens and Plain Shutter, . .	$50 00
Ditto, with Pneumatic Release, ...	55 00
Ditto, with Roll-Holder and one Double Plate or Film-Holder, ...	70 00

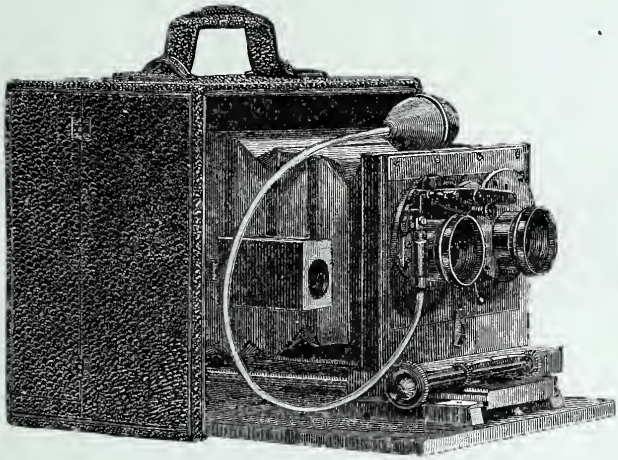
MANUFACTURED BY THE

AMERICAN OPTICAL COMPANY.

THE SCOVILL & ADAMS CO., Proprietors.

THE 5 x 7 HENRY CLAY
STEREOSCOPIC CAMERA

FOR TRIPOD AND HAND USE.



IT is commonly known that of all pictures, those which are arranged to give the stereoscopic effect when viewed in a stereoscope convey the true impression of perspective and solidity.

It seems strange, indeed, that of the myriads of instantaneous pictures made, so few are taken with reference to their future use in connection with the stereoscope, *for it is only by that means that the idea of perspective and solidity can be conveyed.* We can only assign as the reason the present almost universal use of hand cameras, and that none of them have, up to this time, been arranged for stereoscopic pictures.

There is a much over-worked phrase—"the long-felt want," but we think that just that, literally, will be met by the new hand camera which the American Optical Company have just finished.

This camera measures eight inches high, nine inches long and five inches wide; its weight is about five pounds. It has a screw plate underneath, so that it may be used with a tripod. It has a door in the back of the case, and through that opening the image thrown by the lenses may be seen on the ground-glass focusing screen.

The illustration shows the appearance of the camera when open. The pair of Rapid Rectilinear Lenses is fitted with a triplex stereoscopic shutter with pneumatic release, made by the Prosch Manufacturing Company.

The camera is furnished with a focusing scale and a reversible finder. Either half of the stereo. negatives when cut in two are of a size suitable for making lantern slides from.

This camera may also be used to take a single picture of the size of the ground glass focusing screen (5x7 inches), either vertical or horizontal. In the former case the reversible finder comes into use. The septum which divides the camera inside is arranged so that it may be easily taken out; the stereo. lenses are mounted on a removable front and an extra front is furnished on which may be placed any lens of not over seven and a half inches equivalent focus.

PRICE, with a pair of Rapid Rectilinear Lenses and Prosch Stereoscopic Shutter with Pneumatic Release, - - - - - - $75.00

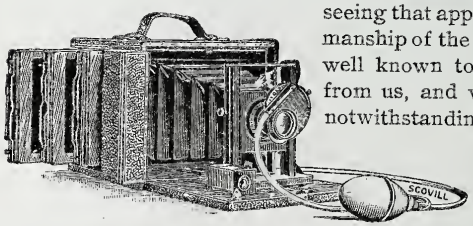
This camera can also be made with vertical sliding and swing front. By means of the former the proportion of sky and foreground may be adjusted; the latter permits the taking of subjeets which may be either above or below the level of the camera and still preserve the lines vertical.

PRICE, with a pair of Rapid Rectilinear Lenses and Prosch Stereoscopic Shutter with Pneumatic Release, and with vertical sliding and swing front $80.00

A 5x7 Roll Holder for Transparent Films can be furnished with either of the above forms of this camera for $15.00 additional. This addition would make the case about two inches wider and one-quarter inch higher.

The Henry Clay, Jr.

PARTLY owing to the march of progress, and partly to the present tight state of the money market, there has long been a demand for a hand camera which should possess all the necessary requirements for good work, but at the same time be obtainable at a reasonably moderate price. That we have successfully met this with our new Henry Clay Junior camera we think all will readily admit on seeing that apparatus. The superb workmanship of the Henry Clay camera is too well known to require any description from us, and we have only to say that, notwithstanding the considerable reduction in the price of the new camera, the finish is in almost every way equal. The Henry Clay Junior is now made in the two sizes, 4 x 5 and 5 x 7, and differs from the ordinary camera of these dimensions in certain points which we shall specify. It contains space for three holders, or six plates. A novel arrangement has been added by which the holders can be slipped into place without the usual inconvenience attached to such proceeding. The lens is a perfect little beauty, and does very fine work. The front portion has a sliding up and down movement for the lens, but no swing; indeed, with a hand camera this is but very rarely necessary, such objects that require it are best left alone with small cameras. The camera front can be fitted into position with the greatest ease. The movement is the work of a second; by pressing the catch the front of the box falls down, a piece of brass is caught hold of, the camera comes forward to the scale and, with one-quarter turn, it is fixed as firmly as a rock into position. The instrument is fitted with revolving diaphragms, reversible finder and an admirable little shutter, which can be used for time or instantaneous work. When closed the dimensions of the 4 x 5 camera are 5¾ x 7 x 6, including space for three holders. Altogether, we can thoroughly recommend this instrument to all who require a first-class camera at a moderate price.



It is manufactured in the works of the famous

AMERICAN OPTICAL COMPANY.

Price, 4 x 5 size, $30.00. Price, 5 x 7 size, $38.00 including One Double Plate Holder.

Extra Double Plate Holders for 4 x 5 size, $1.25 each.
" " " " " 5 x 7 " $1.30 "

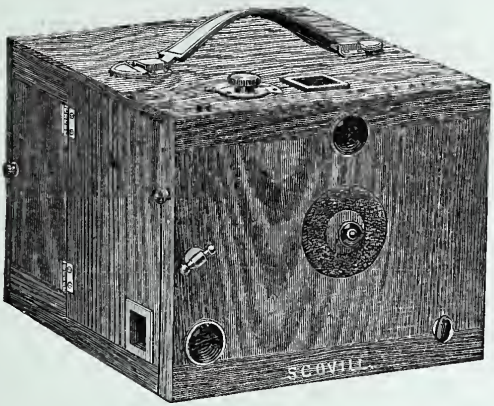
FOR SALE BY ALL DEALERS AND

The Scovill and Adams Company.

IMPROVED

Antique Oak

Detective Cameras.



TO meet the demand for a cheap Detective Camera, within the reach of the youth, and of those who want to make but a moderate investment in photographic appliances, we have introduced the **Improved Antique Oak Camera,** which is certainly lighter and more compact than any other cheap detective camera in the market, and, what is still more important, has a much more expensive and more perfect lens.

This Double Combination Instantaneous Lens, with Interchangeable Stops, when bought separately, costs as much as the whole camera.

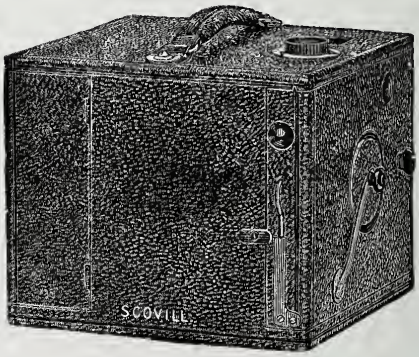
The whole front of this camera is hinged, which is a great convenience. The camera has a Recessed Finder, an Instantaneous and Time Shutter with Speed Regulator, Cap for timed exposures, and one Double Dry Plate Holder.

No. 1.	**4 x 5 Antique Oak Camera,** - - -	**$15.00**
No. 2.	**" Leather Covered Camera,** - -	**17.50**

Manufactured by THE SCOVILL & ADAMS CO.

For Sale by Photographic Merchants.

THE WATERBURY DETECTIVE CAMERAS.



MANUFACTURED BY THE AMERICAN OPTICAL COMPANY.

Timed and Instantaneous Photographs. This is the only Detective Camera which is as well adapted for making timed views as for photographing quickly moving objects. The negatives produced are of such sharpness that they may be enlarged to almost any size. It is

The only Detective Camera made with plate for tripod, and with ground-glass the full size of the plate, just as in an ordinary view camera. This ground-glass is where it cannot easily be broken.

The Recessed Finder shows *the same image* as is included on the ground-glass, though diminished in size. Without this accurate finder, one cannot be sure of what is taken in or left out of an instantaneous photograph.

The Focusing Scale is beside the Finder, where it may be readily seen and adjusted.

PRICE LIST.

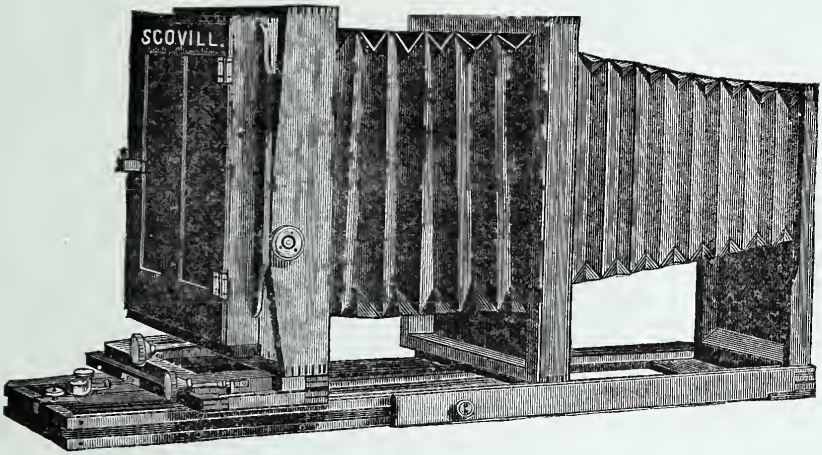
	Leather Covered.
4 x 5 Waterbury Detective Camera, with 2 Double Holders.....	$25 00
5 x 7 " " " " 2 "	40 00

For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.

THE AMERICAN OPTICAL CO.'S

UNRIVALED

PORTRAIT CAMERAS.



The American Optical Company Portrait Cameras are manufactured from the best mahogany, French polished, and have the Lever Focusing Attachment, by which the most delicate focus can be adjusted with the utmost facility and ease. Above 10 x 12 size, they have double bellows, vertical shifting front, the V-shaped wooden guide, and telescopic platform.

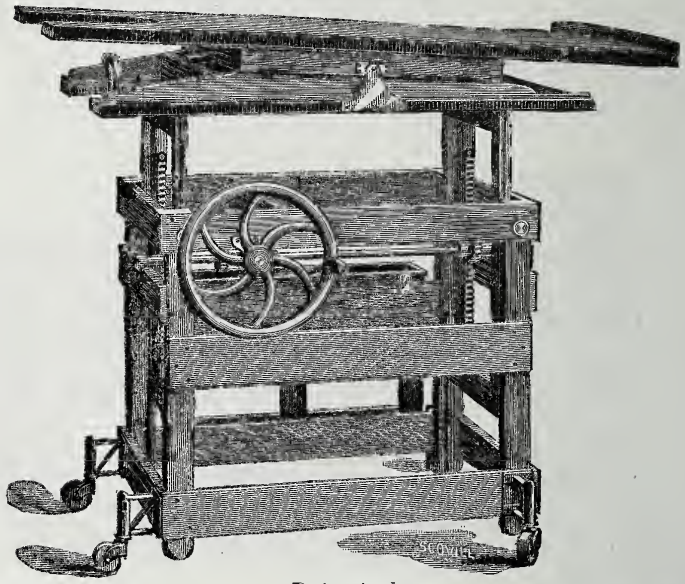
No.	Size.							With Double Swing-back.
5—	8x10 ins.,	with	rigid	platform	30 ins.	long		$38 00
6—	10x12	"	"	"	36	"	.....	48 00
7—	11x14	"	extension	"	48	"	double bellows and vertical shifting front,	64 00
8—	12x15	"	"	"	48	"	"	72 00
9—	14x17	"	"	"	60	"	"	76 00
10—	16x20	"	"	"	65	"	"	88 00
11—	17x20	"	"	"	65	"	"	90 00
12—	18x22	"	"	"	70	"	"	100 00
13—	20x24	"	"	"	72	"	"	110 00
14—	22x27	"	"	"	72	"	"	130 00
15—	25x30	"	"	"	80	"	"	170 00

Buy from Dealers or the Scovill & Adams Company.

THE

"ELITE" STUDIO STAND.

(PRIZE WINNER.)



Patented.

These are the only Stands suited in workmanship and finish, also in size, to the large American Optical Co.'s Cameras, with their great length of bellows and extension platform. Practical portraitists cannot fail to admire the ease with which these stands can be adjusted at any desirable height or inclination, and the noiseless manner in which they may be moved from place to place, their elegant appearance and accurate construction.

Instead of the clumsy levers and racks, by which accurate adjustment of the platform was obtained in the older stands; the proper elevation and inclination are produced in the "Elite" stand by cog-wheel and snake screw, and the manipulation at one side by a wheel with handle, and within reach of the operator, so that he may adjust the height or inclination of this camera without taking his head from under the focusing cloth. By means of the wheel worked at the rear end of the platform, the horizontal position of the platform may be inclined upward or downward to a limit of 15 degrees. A great advantage from this movement, we observe, is that a true horizontal position—so difficult to obtain in the old camera stands—is, with these, an easy matter to effect. This is especially important to those who may use them for reproduction work. In the No. 2 size the platform is fifty-two inches long and twenty-five inches wide, and its length may be increased to seventy inches by an attachment which slides out forward, making it quite long enough for supporting a large copying camera. Then a semi-circular cut-out, to the rear end of the platform, is a convenience to the operator, who is thus enabled not only to stand closely up to the ground glass, no matter how far the camera may have been pushed forward, but bending of the body is obviated, which is quite a necessity with all the older stands.

"ELITE" STUDIO STANDS

	No. 1 Size.	No. 2 Size
PRICE, with Rack and extension for Plate Holder	$32.00	$36.00
Highest point from platform to floor	48	48
Lowest " " " "	32	32
Width of platform	22	26
Length of platform without attachment	45	52
" " with "	60	70

For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.

SOME OF OUR SPECIALTIES:

The American Optical Company's Apparatus
FINEST IN THE WORLD.

Swift, Steinheil and Zeiss (Imported) Lenses
ACKNOWLEDGED TO BE THE BEST.

Gundlach, Bausch & Lomb, and "Waterbury" (Domestic) Lenses
WITHOUT RIVALS IN POPULARITY.

Morrison Celebrated Wide-Angle Lenses
THE BEST IN THE WORLD.

"Three Crown" Albumen Paper
ABSOLUTELY WITHOUT FAULTS OR BLEMISHES.

Waterbury Cardboard
THE UNEXCELLED.

Merck's Superior Pyro, Andresen's (and Hauff's) Amidol, and Andresen's Sulphite of Soda

Prepared Developers
AND OTHER SOLUTIONS, READY FOR USE.

"The Greatest Annual on Earth"
AND OTHER PHOTOGRAPHIC PUBLICATIONS.

Ilotype (Collodion), and Nepera (Gelatine)
AND ALL STANDARD BRANDS OF ARISTOTYPE PAPERS.

All Standard Brands of Dry Plates

Wuestner's Orthochromatic "Imperial" Non-Halation Plates and 50 Sens. "White Label"
THE VERY LATEST.

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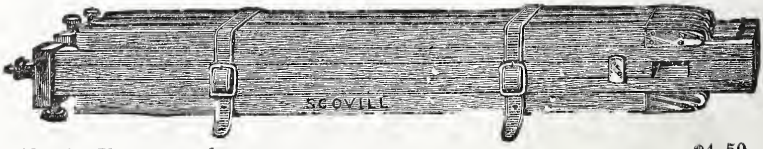
The artistic design and faultless finish of every portion of this Tripod cannot be realized without seeing one, and to use an ALBION TRIPOD means to be fully satisfied, and wish for none other.



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The Scovill Adjustable Tripod.

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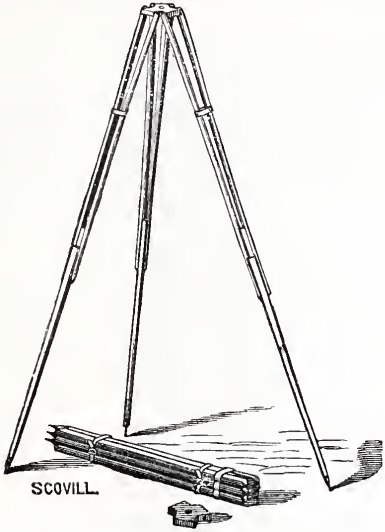

Nothing more compact, certainly nothing as graceful in appearance and light in weight as the new Tripod for out-door Photography, just produced by the American Optical Company, has yet made its appearance. Because so readily adjusted to the utmost irregularity of the earth's surface, it was decided to call it the "Adjustable Tripod." Lady amateurs prefer it to any other pattern on account of its lightness and beauty. The top is covered with billiard-cloth to prevent marring the fine polish on our cameras, and the clamping screws are not detachable.

SCOVILL ADJUSTABLE TRIPOD.

No. 1..... Price, each, $3.50
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Scovill Adjustable Jointed Tripod, to fold and pack in a 22-inch Valise..... $4.00
Do. with Canvas Bag and Handle.. 4.75

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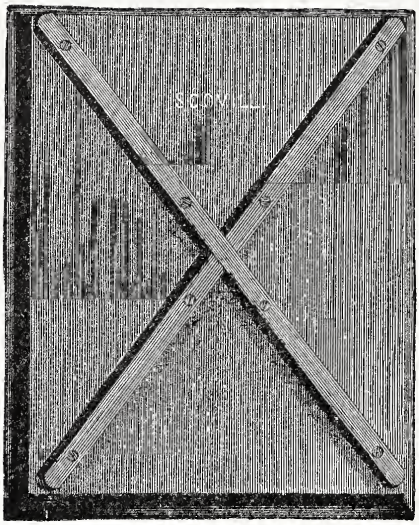

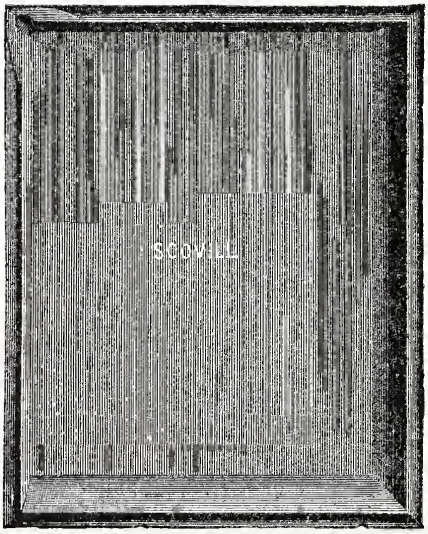

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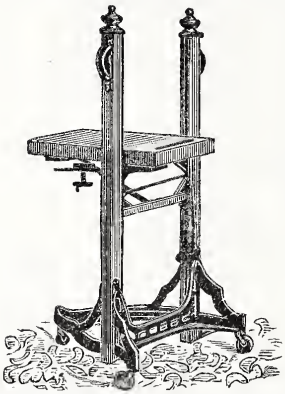

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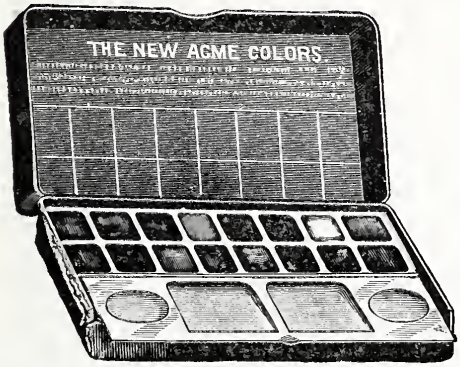

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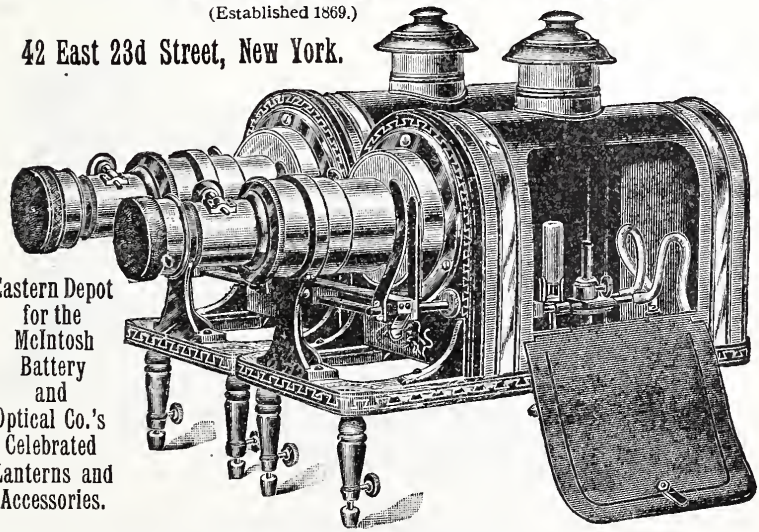

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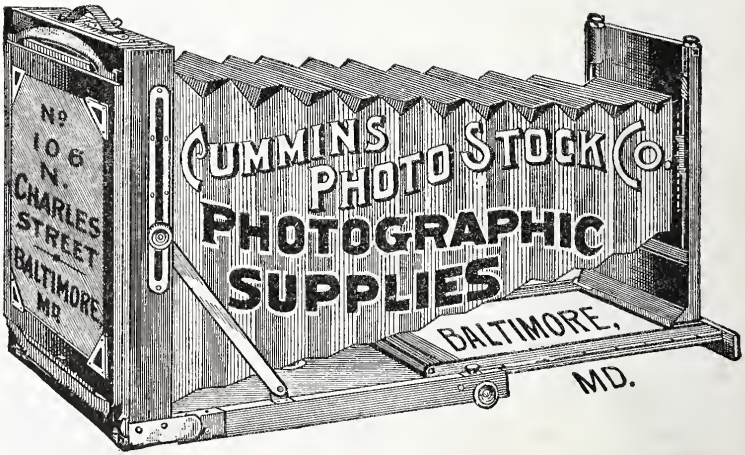

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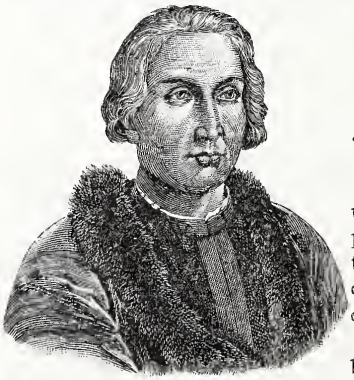

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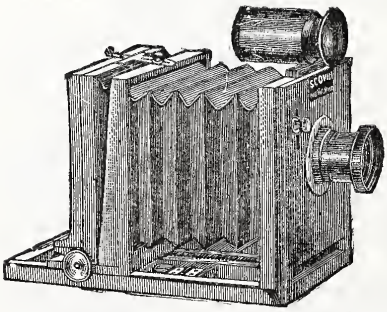

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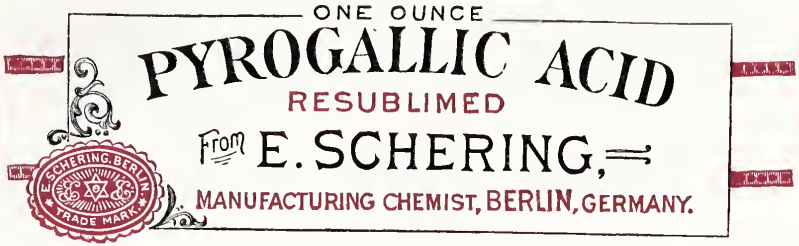

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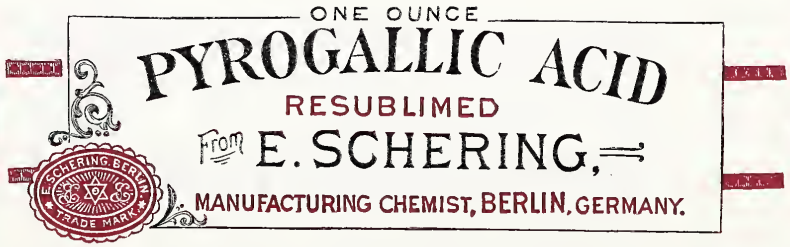

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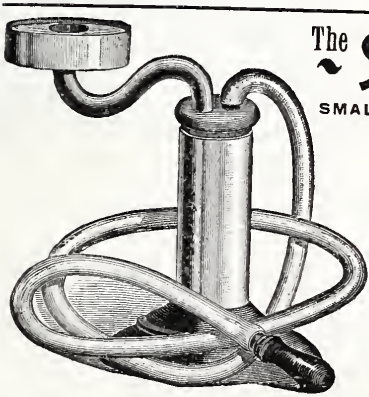

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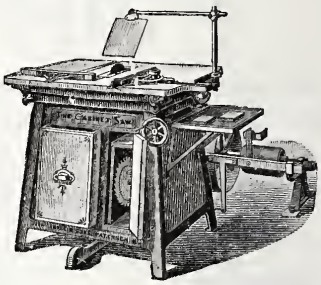

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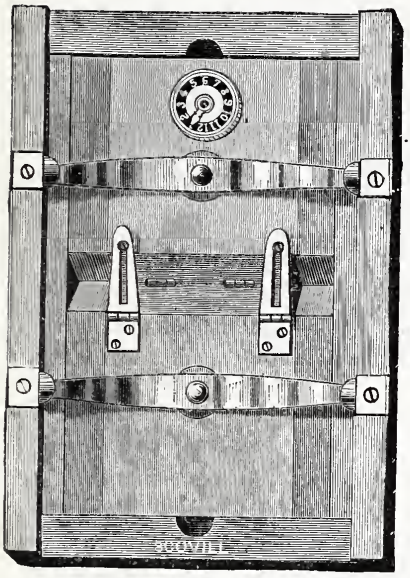
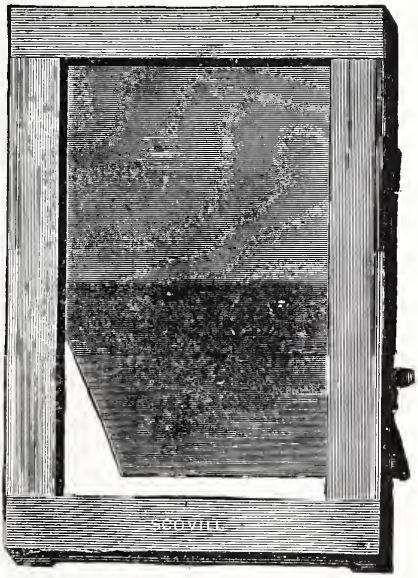


IRVING PRINTING FRAME, CLOSED
FRONT VIEW.



IRVING PRINTING FRAME, OPEN.
BACK VIEW.

The IRVING FRAMES have valuable features which cannot be copied. They are in workmanship, design, and other respects, superior to all other printing frames.

The continuous felt pads made especially to order for us, insure absolute protection and uniform pressure throughout. The Irving Patent Catches lock the back, so that when one flap is open there is not the slightest danger of the flaps, paper or negative slipping.

The springs are cut by dies of specially tempered and tested metal, and are riveted to the backs with washers underneath to protect the woodwork.

The IRVING FRAMES are made of cherry guaranteed not to warp or crack.

The tally does not depend upon any other part of the frame to lock it, for the pointer will remain in place no matter what is done to other parts of the frame.

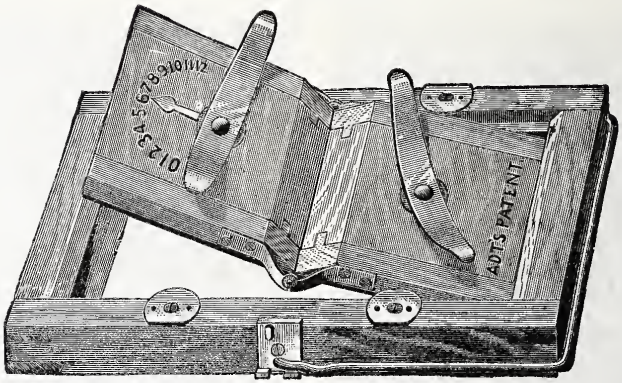
Prices for Half or Two-thirds Opening Styles.

3¼ x 4¼	$ .45	5 x 7	$.60
4 x 5	.48	5 x 8	.65
4¼ x 5½	.50	6½ x 8½	.70
4¼ x 6½	.55	8 x 10	.80

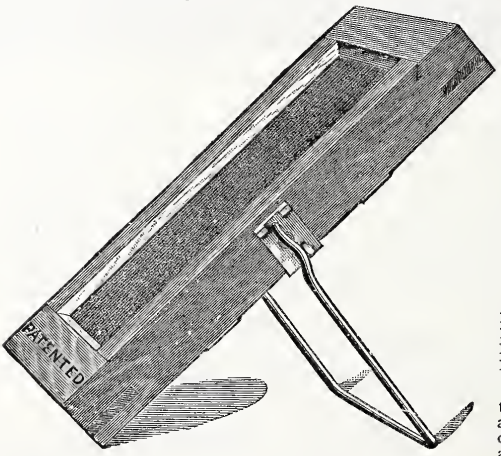
When made with backs to open lengthways, ten per cent. is added to the foregoing prices, for the respective sizes.

For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.

ADT'S PATENT PRINTING FRAMES.



These Frames are now supplied (without extra charge) with Adt's Patent Support with which the frame can be stood on either end, and at four different angles, for exposure while printing. It is out of the way of the printer when introducing the paper, or examining the print, for when the frame lies or is held with back up, the support instantly drops upon its stops for rest, and is entirely out of the way of the hand of the printer, so that he may remove or open the back-board, or replace it, as if there were no support present. Being arranged close around the sides and ends of the frame, it occupies so little space as not to interfere with the packing or storage of the frames, and when the printer places his frame for exposure the support readily finds its position for supporting the frame without any special manipulation.



PRICES.

3¼ x 4¼	$0 50
4 x 5	50
4¼ x 5½	50
4¼ x 6½	60
5 x 7	65
5 x 8	65
6½ x 8½	75
8 x10	85
10 x12	1 15
11 x14	2 15
13 x16	2 40
14 x17	2 80

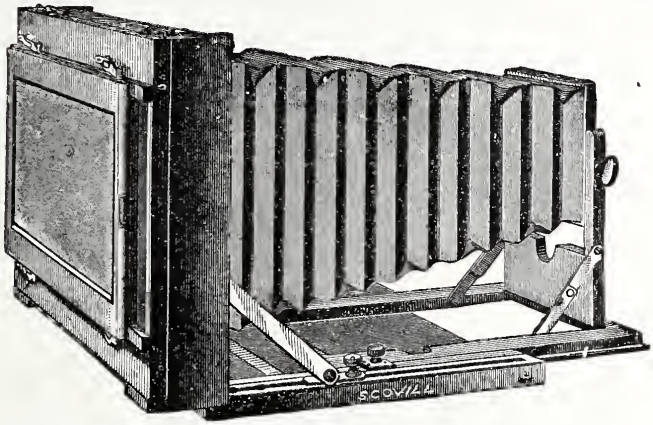
When made with back to open lengthways, an additional charge of 10 per cent. will be added to the above prices.

As will be seen by a glance at the cut, the adjacent edges of the parts of the back-board are beveled outward, and the hinges placed on the sides with their axes on a line with the surface. This permits the attachment to the face of the back-board of a **Heavy, Continuous Elastic Felt Pad.** This obviates the necessity of using a separate pad, which is so easily misplaced and lost.

For Sale by all Dealers in Photographic Materials and The Scovill & Adams Company.

IRVING VIEW CAMERAS.

The IRVING Camera recently introduced by the American Optical Co. was awarded the highest prize by the judges at the American Institute Fair. They expressed themselves as unable to see how a more complete, compact, light, handsome and serviceable camera could be made.



The Irving Cameras all have swing front in addition to swing back, vertical shifting front board. They have the Howe patent reversible back, fitted with self-locking ground-glass frame, and when desired, celluloid is used in place of glass for the focusing screen.

One of the best features of the camera is the absence of detachable screws. An idea of this is conveyed by the illustrations showing the camera when extended and when folded.

A superb canvas case, the finest ever made, is supplied with each one of the Irving Cameras. Price list is as follows:

	Single Swing.	Double Swing.		Single Swing.	Double Swing.
4 x 5	$27.00	$32.00	10 x 12	60.00	$65.00
5 x 7	33.00	38.00	11 x 14	65.00	70.00
5 x 8	35.00	40.00	14 x 17	75.00	80.00
6½ x 8½	40.00	45.00	17 x 20	85.00	90.00
8 x 10	45.00	50.00	18 x 22	95.00	100.00

In order to convey an idea of the lightness of these cameras, it is sufficient to say that the 5 x 8 size camera weighs only 3 lbs.

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Seed Specialties:

SEED "GILT EDGE" No. 27 PLATES.
SEED No. 23, No. 26 and No. 26x PLATES.
SEED NON-HALATION PLATES.
SEED NEGATIVE AND POSITIVE FILMS.
SEED HYDROCHINON DEVELOPER.
SEED EIKONOGEN DEVELOPER.
SEED POSITIVE VARNISH.
SEED VIGNETTERS.
SEED CELLULOID PANELS.

Send for PRICE LIST and SEED'S "MANUAL" on the Use of Plates.

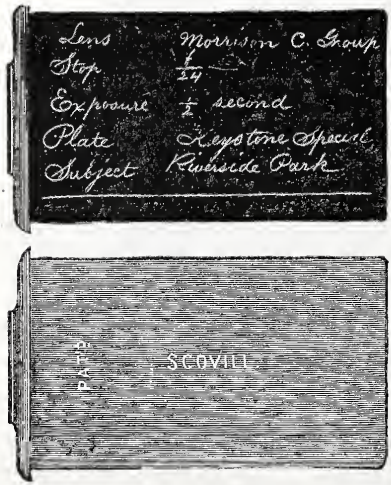
M. A. SEED DRY PLATE CO.,

Works, Woodland, Mo.

St. Louis: 2005 Lucas Place.

New York: 57 East Ninth Street.

REGISTERING SLIDES.



IN the pleasure or excitement attendant upon picture-taking, holders and slides have been so changed about that the note-book afforded no clue to their identity. All photographers, whether professional or amateur, who have in time past puzzled their brains in the endeavor to solve such vexatious questions as these:

"Have I or have I not exposed that plate?"

"If exposed, was the plate used for that prized picture?"

"Shall I incur the risk of making a double exposure?"

henceforth will have themselves only to find fault with if they do not procure and use in their dry-plate holders the patent registering slides, or as they have been called "Record Slides." These can be written upon with slate or lead pencil *ad libitum*, and the writing erased without injury to them.

Patent Registering Slides are supplied with all American Optical Co. Dry Plate Cameras and Amateur Outfits up to 10 x 12 size without addition to price list.

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Eastman's Transparent Films,
Eastman's Transparency Plates,
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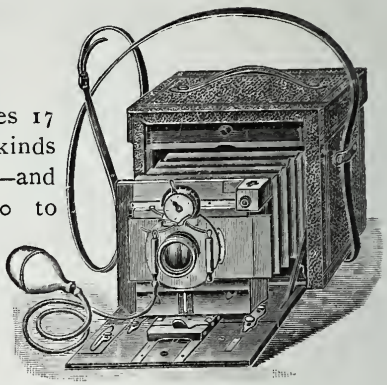
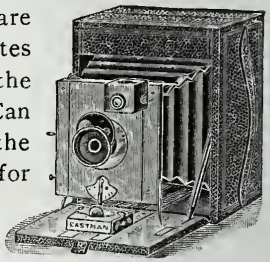
Kodaks



Improved Folding Kodak.

The Kodak series now includes 17 styles and sizes—seven kinds use either plates or films—and ranges in price from $6.00 to $100.00. The Improved Folding Kodaks have double swing back, rising front and iris diaphragm shutter. They are, in short, fully equipped view cameras, combined with the compactness of the Kodak.

Kodets



The Folding Kodet.

The Regular and Folding Kodets are designed for use with glass plates but can be used with roll film by the addition of a Kodet roll holder. Can be focused with the index or on the ground glass—improved shutter for snap shots or time exposures. Handsome finish, finest adjustments. 4 x 5 Kodets $12.00 to $20.00.

Transparent Film.

Our New Film is rapid, is evenly coated, does not tear or frill and retains its sensitiveness as well as glass plates. **We date every package** and customers can thus make sure of getting film not over six months old when purchasing.

EASTMAN KODAK CO.

Catalogue Free. Rochester, N. Y.

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with every fresh batch of paper. We did the experimenting before putting the paper on the market, and were so successful that a prominent stock dealer writes us: "Solio is the most uniform paper that we sell."

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STANDARD BROMIDE. This paper produces the best possible results from thin, quick-printing negatives. It gives rich, brilliant effects, and an unequaled breadth of half-tone.

EXTRA QUICK. For artificial light and for printing from strong negatives where the standard gives hard effects.

EUREKA BROMIDE PAPER. Especially adapted for copying, contact printing and enlarging with artificial light. Made in three grades: No. 1, thin smooth ; No. 2, heavy smooth ; No. 3, heavy rough.

ENAMELED BROMIDE. Unequaled for brilliant, glossy finish. Contact prints or enlargements on this paper give clear high lights, beautiful half-tones, and deep, rich shadows. No other paper gives such beautiful sepia tones.

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